



THE  
SURGICAL CLINICS  
OF  
NORTH AMERICA

APRIL 1923  
VOLUME 3 — NUMBER 2  
NEW YORK NUMBER

PHILADELPHIA AND LONDON  
W B SAUNDERS COMPANY

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# CONTRIBUTORS TO THIS NUMBER

FRED H ALB D F A C P f sor d D ec f D rtm f Orth d  
 Sur ry New Y Pos Gra te M d cal Sc l nd h Ura y V  
 m C nsul b P syl Raiload S m C m Reh balata  
 tio C mmas Sta N w J ey M d cal to t D rtm f Lab  
 f h Sta N w Y Orth C lta h Se d C rp A U S Army  
 Res rv V O d S eo to h N w Y P Grad te H tal c.

FREI RIC W BANC OFT M F A C S Ass d A t d S r g N w Y k  
 Hosp tal I tra f S ry C lmbia Unr er

EDWIN BEER M D v ag S M S d H H tals

R. V BO ING M D As S S L d B b H tal

JOHN F CONNO S M D S af D H l m H tal

WILL A A DO NES D P f ss f Cl i s ry C H f P cl d  
 B b C mb Unr er N w Y k A t l S L k M m l d  
 H tal New Y k

NATHAN GREEN M D Sur h C H l A t S S L k  
 H tal

CHARLES GORDON HEYD M l P f f S ry N w Y k P Grad te b d cal  
 Sch l Hos l A P Gradua H tal C S  
 D H l D N J m M m l H tal M rrs ow N J d  
 G w H ta G w ich C

R CHARD L ISOHN M D A d B h l Hos l A oc S  
 M H tal

CON TAN NE J GURE J M D F A C S A A l S d  
 H d H tal l ru tor i Sur ry C l f P  
 Surg C l b Ura

WAL ON A ARTIN M D A d g S L k H tal d P so f C cal  
 ry Col m Unr

CLAR NCE A M ILL IS l D F A A s P f so f S ry New  
 Y k P l cl d ca Sc Assoc A h N w Y k d  
 C h A d N w Y k P clu H ta

MORR SA S ITH l D A ta d S S Luk H tal l ct  
 ry C U M cal Sc ool

D Wl T STETTEN M D A d S eo Le H l H tal

A. RAY OND STEVEN M P of so f U l gy New Y k l cl School d  
 f os tal ca P ofeso U gy New Y U l ta A nd S  
 U l gica D rim B evu Hos tal

BYRON S OOK Y D A socia N l gy C lmb U l rs A ocate Su  
 eo New N Hos tal A As st Pr f ssor N w Gradua  
 C f os tal A te N ur m V d b C f N ur l gical Sur ry k

EL ER P VEIGE M D Ass of sso f Ort ped S ry New Y P  
 Gra ca Sc ool d Hos ta l ruct I Ort ped S ry U ra f  
 m te Orth ped eo l So l Hoc ped m rrs tow N J C  
 B m Sa m Sco Plar N J os tal D N J Rahwa H p l d

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# THE SURGICAL CLINICS OF NORTH AMERICA

Volume 3

Number 2

CLINIC OF DR. FRED H. ALBEE

NEW YORK POST GRADUATE MEDICAL SCHOOL AND HOSPITAL

## UNUNITED FRACTURE OF THE LOWER JAW WITH OR WITHOUT LOSS OF BONE

VERY little information on the treatment of maxillary fracture is found in the works of early writers on surgery. This is probably due to relative scarcity of these lesions and the difficulty of treatment. What little information is found is on the inferior maxilla.

Hippocrates (460-370 B. C.) distinguished between complete and incomplete fractures. In his classical books *De Fracturis* and *De Articulis* he dealt with surgery and gave these fundamental principles:

- 1 That in surgical affections there are the same movements and spontaneous proceedings of recovery as in medical affections.

- 2 That the surgical therapeutics must proceed like the medical with simplicity imitating nature and operating jointly with it, the surgical operator making it possible for nature to accomplish the recovery of the lesion which pre-existed the operation and restore that which was made by the instrument.

Adapting these principles to that of mandibular fracture Hippocrates says:

If the reduction has been well performed the part kept in proper repose the consolidation takes place in a short time and the teeth do not undergo any damage. In the contrary case the cure is retarded, the fragments united in bad position and the teeth are useless.

In order to retain fragments of bone in position, he

ligated the teeth proximate to fracture preferable with gold



Fig 10 —Case S I Lateral view demonstrating the position of the head.



Fig 103 —Case S I Demonstrating the position of the head and neck.

wire or linen thread Two straps of C. thagin leather fixed to the chin.

Directly after Hippocrates we find few new ideas and these only a modification of his methods Aulus Cornelius Celsus (about 30 B C) in the seventh chapter of the eighth book of his Medicine says

In fracture of mandible we must first of all replace the fragments to their normal position Then in case of transverse

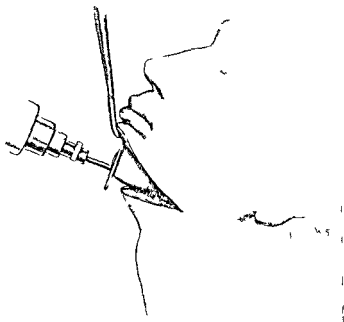


Fig 104—Case S I D m trat dva tag f m t w hap g  
fl t rf t no f ce f j wt ce v bo gr ft (Se Fg 105)

fractures it is necessary after havin set fragments in place to tie together the two teeth nearest to fracture with silk thread After this one should apply externally to part corresponding to lesion a thick compress dipped in wine and oil and sprinkled with flour and powered olibanum This compress is to be fixed in place by means of a bandage or strip of soft leather with a longitudinal slit in middle to embrace chin the two ends being



ligated the teeth proximate to fracture preferably with gold



Fig 102—Case S I Lat ral vi w d m t t g d g h



Fig 103—Case S I D m rat ff cem f so t a d  
t ject uabl sca

wire or linen thread Two straps of C thagin le the fixed  
the chin

Directly after Hippocrates we find few new ideas and these only a modification of his methods Aulus Cornelius Celsus (about 30 B C) in the seventh chapter of the eighth book of his Medicine says

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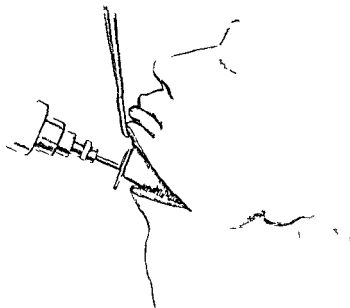


Fig 104—Case S 1 D m strat dva tage f m t saw in hap g  
flat rf ce t nor f ce of j wt ce ve bo gr ft (Se Fig 105)

fractures it is necessary after having set fragments in place to tie together the two teeth nearest to fracture with silk thread After this one should apply externally to part corresponding to lesion a thick compress dipped in wine and oil and sprinkled with flour and powered olbanum This compress is to be fixed in place by means of a bandage or strip of soft leather with a longitudinal slit in middle to embrace chin the two ends being

tied together above head. Fractures of lower jaw and of maxillæ commonly heal from the fourteenth to twentieth day.

Here by Celsus is first mention of sling for chin erroneously attributed to Galenus (131 A. D.). This bandage was really a perfecting of Hippocrates' method. It is also described before Galenus by Soranus of Ephesus Junior (97 A. D.).

Among the Arabians Avicenna in the Middle Ages is still considered among some of the orientals as the greatest teacher

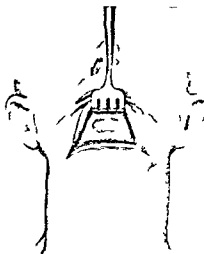


Fig. 105.—Case S. I. Anterior aspect of jaw freshed ready to receive bone graft.

of medicine. He wrote a chapter on mandibular fractures in which he emphasized one important point of interest. He urged that after first aid to the injured had been given the operator should be called in order to re-establish the level of the maxillary arches. He describes the bandage of chin very well. Put the two ends from the two sides over the head to the ends of the mandibula then from here again to the nape of the neck then to the place below the chin and over the two maxillary bones.

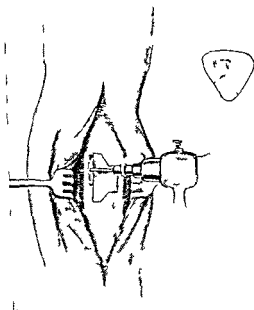


Fig 106—C S I I d t h p f b gr ft d m th d f obt g  
d m l d g t w th Alb b mull

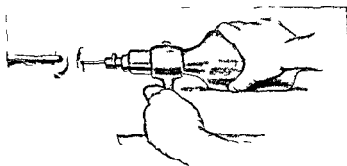


Fig 107—C se S I D m t f th h p g f g f t f m t  
p pose d m th d f mpl h g t Th gr ft t t t ly pl ced  
st t p f j w d k w th be ta tss d w twith  
All el mp Th co t f th h th f m d t d d d the d d  
co m t h g ce mpl h d by m v g th g ft d d d t nally  
hap g t h h

to the crown from here again to the place below the nape of the neck and put another ligament over the forehead and across the back of the head and fasten everything and put over all a soft cloth

In 1180 at Salernum was compiled the text book of surgery called *Maestro Rugero* from Parma which with the notes added in thirteen and fourteen centuries constitute the greatest

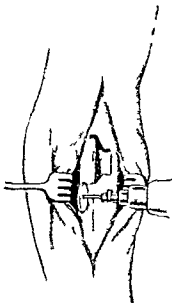


Fig 103—Case S I Dem t f m h r e b o f d w l peg as  
bt ed d m thod f sec n g

book on surgery of the so-called *holistic* medicine. In it the following treatment of mandibular fracture is given under the heading of poultice and liniments

Take olibanum mastic colophony glue dragon blood all this must be mixed with liquefied resin and becomes ointment which is placed over the teeth till the complete consolidation and everything must be fixed with the little laces in order that the portions be prevented from moving out of place

In 1275 Wilhelm from Piacenza wrote in Verona the *Praxeos Totius Medicinæ* in the second part of which (Surgery) he speaks of fractures of the mandible and advocates binding teeth proximate to the fracture not only between themselves but also to the corresponding teeth of the maxilla

Ambrose Pare the great French surgeon who lived between 1517 and 1590 modified thus the so called Galen slin There

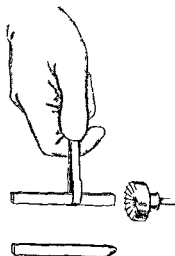
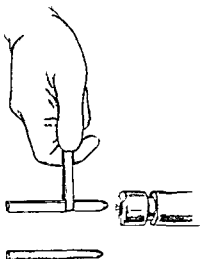


Fig 109—Case S I M th d f p o d g cal d by m of  
 Albe bo mill th g ftt b l t h ped t d w l p g Th p po  
 fth soth t t w l d r t d l l l ly w th t th g lso  
 th t t w l l g g t f t ly d l h p (See Fig 110)

will be applied a leather ferrule such as from which the soles of a boot are made which has been divided in the middle at the level of the chin lon and wide as the mandible and there will be made a ligature with a band two fin ers wide and as long as necessary cut at the two ends leaving only 1 inch and at the level of the chin it will be parallelly cut for the purpose of embracin and pressing better over the chin once at the torn extremities the shorter will be sewed at the top of the head to

a n i ht cap or calotte and the other two longer ends will be kept transversely and sewed behind the same cap everything done as skilfully as possible in order to hold well the fracture

Fabricius from Aquapendente (1600) advocates supplying the inefficiency of the sling of the chin with two when already Teododicus of Bolonga (13th century) had thou ht to supply it with a mall cu hion



Fg 110—C se S l Th co l h be m d d th  
d il g h bee p t pl ce Th gr f h be h ped int  
d l h l d g Th p oc d f h p g graft ha  
m d b t f m t

Robert Ben on (143 French) n h i tr ati on di eases of teeth relates 2 c es of fractu f lo er j which he succeeded in curne in a sh rt time by metho l f binding the teeth One of these case s te of fract re corr pon l ith bic pid huch had fallen out as result of traum —ne hb ring teeth lso loo ened Ben on filled empty j left by l i cu p d v ith piece of i ory prov led v th t o hol's By geniou c ossi g of threads from ec n l molar o one l to ec n l bic pil on

other tightly tied he formed a single block and succeeded in bringing about consolidation of teeth and complete cure of fracture in less than a month.

In the middle of the 18th century bandages of chin were still in fashion. Gradually they came to realize that they should combine the sling with a point of support on the chin. With Chopart and Desault (1780) begins an era of scientific treatment of fracture of the maxillary bones.

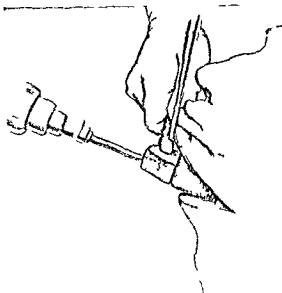


Fig 111—Case S I. The jaw being drilled with the perforator and with peg graft.

The possibility of correcting a hideous distortion of features or of replacing a large section of the human face was not fully realized until the great European War produced so many mutilations. The public at large and even a considerable number of members of the medical profession were unfamiliar with the advances made in plastic surgery. Military surgeons were soon confronted with problems with which they were unfamiliar but they quickly used with ever increasing skill the reparative



a night cap or calotte and the other two longer end will be kept transversely and sewed behind the same cap everything done as skilfully as possible in order to hold well the fracture

Fabricius from Aquapendente (1600) advocates supplying the inefficiency of the sling of the chin with two when already Teododicus of Bologna (13th century) had thought to supply it with a small cushion

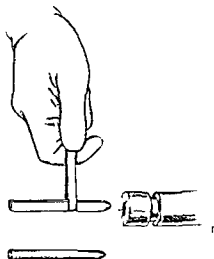


Fig. 110—Case 51. The illustration shows the method of using the graft. The graft is placed in the socket of the tooth. The graft is held in place by the tube. The graft is held in place by the tube. The graft is held in place by the tube.

Robert Benson (1433) in his treatise on the care of teeth relates two cases of fracture of the jaw which he succeeded in curing in a short time by a method of building the teeth. One of these cases was a site of fracture complicated with a piece which had fallen out as a result of trauma—neighboring teeth all loosened. Benson filled empty space left by the piece with ivory provided with two holes. By means of a cross of thread from a cotton reel on one side to a small copper pin

When great masses of skin muscle and even bone have been torn away there sometimes remains a hinge like attachment to head or face. This form of injury will sometimes permit replacement of tissues. It may be possible to attach a band of metal to head and from this carry a spring with a pad to press the loosened tissue against the region to which it should be sutured. Tacks may be used to nail such a flap in position if firm bone underlies it.

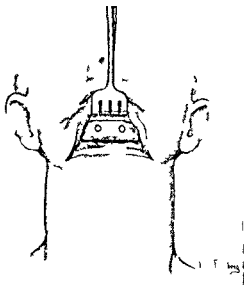


Fig 113—Case S I Ant n w ft g ft h be fi mly fix d pl  
by m f tw d w l peg g ft

Northcroft's statistics demonstrated that fracture of the mandible as compared with fracture of the maxilla occurred in a ratio of 4 : 1. Fracture of the mandible as compared with fracture of both upper and lower jaw were in the ratio of 9 : 1.

The problem of pseudo-arthritis frequently encountered in these cases has been in the past a baffling one.

Repair of fracture of the lower jaw with or without loss of substance involves fundamental orthopedic principles. One of

methods of Tagliacozzi Szymanowski Nelaton Wolf Lever  
Morestin Esser and others

Reparative surgery of face follows identical methods for reconstruction of wounds received in warfare and those caused by industrial accidents

In extensive osseous injuries the bone should be accurately

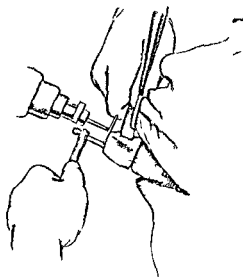


Fig. 112—Case of the jaw fixed by the use of the intermaxillary fixation appliance. The patient is shown with the appliance in place, which is used to hold the jaw in position during the healing process. The appliance consists of a series of bands and wires that are attached to the teeth and the jawbone. The patient is shown with the appliance in place, which is used to hold the jaw in position during the healing process.

adjusted and held in position if necessary by known tendon sutures strong wire on teeth as interdental splint

Early replacement of displaced soft parts with cooperation of dental surgeon is important. It is a effort to prevent facial deformities by immediate reproduction of at least semblance of anatomic correctness. Few general surgeons have had sufficient training to manage the immobilization of jaw by interdental splints



F 116—Case S I Lat ral w t k f m th ft perat d  
d cat th m t t wh h th h wa l g d.



F g 117—C A C Ag tw ty ght Sold A E F Compo d  
mm t d f t f ght m fl w j w t So so J ly 21 1918 by  
ma h g b l l t W d heal d A gu t 23 1918 A l y bo gr ft  
from th right t b d th case t U S A Ge l H p tal N 3  
Col ia N J by th th F b ry 5 1919 Th val w  
t f l A t d t l pl tw w r n f tw m th ft p t  
F m f th graft t th j w fragm t oc d seve week t m  
Th re lt wa most sat f c t ry th compl t t t f f c t Th  
ph t graph h ws both los f teeth d f l ty l m t f j w f gm t  
bef bo graf perat



Fig 114—Case S I D m t t peri w f t b l graft two  
m ths ft be g pla d t n f ce f th l w j w as indicated  
by rrow d cat t d f d l graft pegg g large graft t  
jaw



Fig 115—Case S I Lat l y tak th m th ft mpla t  
to f graft. Th arrow d ca th dth f b graf d th ma kabl  
way t ha d t th j w

the primary obj cts of the urgeon L the p c enti n of deformity  
always as ociated with unt eated cases of loss of bone of the

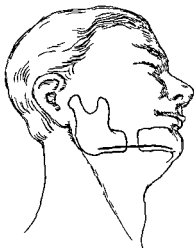


Fig 119—C A C Sh w gth l fth ka lat t th  
f gm t

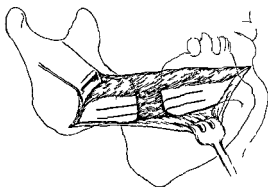


Fig 120—C se A C Th soft p rt h b t t d f m th j w  
f gm t By m fth t w with th bld t bo t h p rt  
p ll sa t h b m d h f gm t f d t c f bo t  
l h f m th d d t d g d w t th m w C t  
th m d t th t m t fth pa ll saw t d th t p f bo  
l d d w th th w t m d t f m th bed fth p p sed  
l y bo gr ft by m f w teot m m t b rr d m ll drill  
h w th f ll g fig

and the principle involved in the reduction of the displacement and the maintenance of the bony fragments in their proper

jaw As in other orthopedic procedures the mechanical control of the jaw fragments and the necessity for prevention and correction of the deformities and distortions resulting from the solution of continuity is emphasized The modus operandi of their causation is identical with deformities occurring at the knee or hip as follow

The mechanical displacements of the fragments following fracture of the jaw with or without loss of substance are caused



Fig. 118—Case A. C. Roentgenogram of the jaw showing the displacement of the fragments. The soft parts are not visible.

in precisely the same way as fragments displaced in a fracture of the femur or other extremity bone. The solution of mechanical continuity results in the unbalancing of the muscle control. For instance, it may occur that all the adductors are attached to one fragment while all the abductors are attached to another. This means necessarily a displacement in alignment of the fragments providing no mechanical influence is used to prevent it.

The same applies to the displacement of the jaw fragment

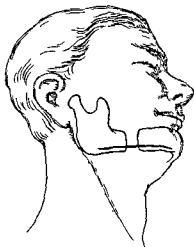
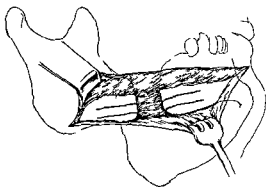


Fig. 119—Cross section showing growth of the kidney with age.



Fg 120—C A C Th soft p r t h be t c t d f m t h j w  
f g m t B y m e a f t h t w w w t h t h b l d t b o t f h p r t  
p l l s a w t h b e m d h f g m t f d t f b t  
l h f m t h d d t d g d w n t t h m a w C s- t  
t h m d t t h t m t f t h p l l w t d t h t r a p f b o a  
l d d w t h t s a t m d t f m t h b e d o f t h p p d  
l y b o g r f t b y m f w t t m m t b d m l l o d r i l l  
h w t h f l l w g f i g u r e

and the principle involved in the reduction of the displacement and the maintenance of the bony fragments in their proper



alignment are the same. In other words, the work imitates in every respect osteoplastic orthopedic work done in other part of the body.

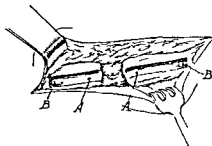


Fig 11—Case A. C. Showing the fragment laid bare in the gutter of medullary canal. The graft which is to rest in the continuity of the bone is indicated by the letter 'A' and the cavity of the medullary canal is indicated by the letter 'B'. Note that the gutter has been made sufficiently large for the purpose of passing the healthy marrow section. The object is to contact the marrow of the graft with the healthy marrow of the bone to import to it the necessary growth of the graft.

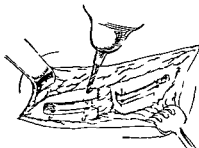


Fig 12—Case A. C. On completion of the thin section of the graft and the dagger is placed in the canal in the separate of the soft part of the import to the end of the graft. The drill hole is made indicated by the letter 'A' and the part of the graft is indicated by the letter 'B'. The gutter is so directed that the hole is made so that the bottom of the gutter is in contact with the bone.

If a deformity has already occurred, the should be on continuous applied pressure. The contraction of the maxilla joint is corrected in the same manner as that of the hip-joint.

constant pressure being brought to bear in the proper direction by a specially devised splint which shall correct the deformity. The

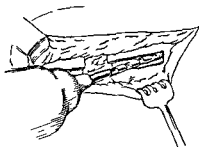


Fig 123—C A C H g m d th t p f b th fo m  
t f th g tt m pl t d by m f m d m d m t drill I  
th type f k th m t d ll f g t d t g g t th h d sa  
f th ; b d th t f g at fit f p rt

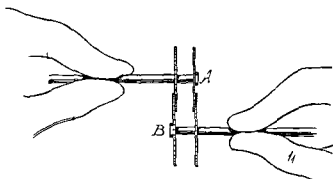


Fig 124—C se A C Th bl d f th t A adj t d t  
m k th w ll f th g oo th j w f gm t t wh h the gr ft t  
be fit d Th bl d f th t sa B dj t d t m the l y  
gr ft f m h t b l ll be t d th t th saw bl d f B t t  
d t d g th t f h f l d f A by j t t th th k f  
th bl d By th dj tm t f th saw bl d th ma g fit  
f th g ft t bed d If th t saw sed nadj t d th  
m l f th g ft d th f m t f th b d t w ld lt th t th  
gr ft tw th th k f th saw bl d mall tha th d th f th  
bed th t m f bo be g l t sawd t Th bo h m  
d vied t d h t

muscles of mastication are constantly drawing the bony tissues in ward and this should be controlled at the earliest possible moment

alignment are the same. In other words the work simulate in every respect osteoplastic orthopedic work done in other parts of the body.

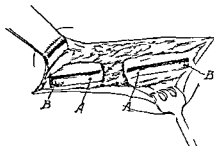


Fig 121—Case A. C. Sh. g. th. j. w. f. gm. t. l. d. ba. th. th. gutt. f. rmed. f. th. rec. pt. f. th. un. y. gr. ft. h. h. as. t. t. th. co. t. ty. f. th. j. w. A. indicat. b. rnat. ed. bo. wh. h. fill. th. marrow. cavity. t. th. d. f. th. fragm. t. B. h. th. reg. f. th. marr. w. h. t. th. t. th. g. tt. ha. bee. mad. f. fici. tly. g. f. th. purpose. f. pen. g. p. th. h. lthy. marr. w. sect. Th. d. q. t. co. tact. f. marrow. f. graft. with. h. althy. marr. w. b. t. ce. f. h. t. mport. t. f. t. th. cc. ss. ful. gro. th. f. th. gr. f. d.

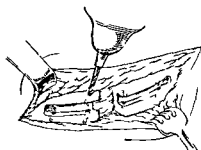


Fig 122—Case A. C. O. f. h. h. ss. f. h. j. w. fragm. t. d. th. da. ge. f. pe. t. g. th. ral. ca. y. th. separat. f. h. sof. pa. t. d. th. mport. t. ru. t. f. th. g. d. l. h. l. and. indicat. d. th. peri. part. f. th. g. tt. th. d. ll. t. d. t. th. t. p. f. th. gutt. d. so. d. rect. d. th. t. th. h. l. th. d. l. th. l. port. th. drill. h. l. mad. so. h. t. h. t. th. bott. m. f. th. gutt. d. com. t. d. m. h.

If a deformity has already occurred, should be continuous applied pressure. The correction of the maxillary joint is corrected in the same manner as that of the hip joint.

In the early days of the war where extensive separation of skin and soft tissues of face accompanied fractures of jaw bones with loss of substance the inclination was toward immediate closure of facial wounds by suture little or no consideration being given to early correction of bony displacement

As a result cases finally came to the oral and dental surgeon with soft tissues tensely united over deformed bones and dif



Fg 127—C A C Sh w g  
pat t bo t th m th ft  
p t

Fg 18—C se A C F l  
lt l m th ft st t  
f t h fl f b th  
ght l w j w by m f t b l  
ly Th w p f t d  
th p t t bl t f t t  
m lly

ficulties in correction are enormously increased. Now it is an acknowledged fact that no attempt should be made to suture soft parts with idea of closing gap until such a time as union of fractured parts in correct relation is well under way and permanent plants are adjusted.

**The Interdental Splint**—With the co operation of the prosthetic dentist an efficient interdental splint should be devised and applied as soon after the receipt of injury or following the

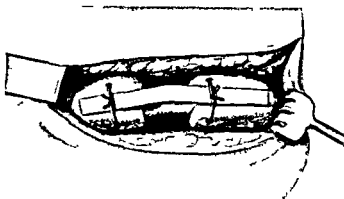


Fig 125—Case A C. Sh g th l y bo graft pl ce th  
 ka ga oo-t d l gat h ld g t N t t l ight gulat to  
 whu h d pt t t th j f gm t t g l h f bo l ss



Fig 126—Case A C R pl m fl f bo h l j by  
 t b l l y or f d d by 1 B Th oe g gr m k  
 h m th ft th pl pe t f th g f th th  
 h t fragm Th fi l l h se m sat f ct ry t h  
 pat t th re w pe fec d h l g h m pl very f  
 m l f t

It should be noted that reparative work on the jaw is very favorable as far as the nourishment of the graft is concerned owing to the profuse blood supply. The early and complete nourishment of the graft is a most important factor and here we have very favorable conditions.

Various technical procedures have been advocated in the treatment of war injuries to the jaw. Notable among these



Fig. 130—Ca G M R tg g l t l v w h g l s f  
t ch d lo j w f m l t m l d t b k f th la t m ol  
th l t f p l d g

methods have been the osteoperiosteal technic revived from the days of Ollier by Delageniere and used by him more or less extensively the ped cled graft advocated and used by Cole the cartilaginous transplants of Morestin. In a recent treatise on the jaw Imbert and Real thus summarized work with bone grafts on war cases in France and in Europe.

We believe we are justified in concluding at the present

removal of bone substance for malignancy or other cause in order to prevent deformity. The dental splint should be used continuously if possible from the time of injury until the jaw is fully restored by the bone graft or until union is complete. Each case presents individual difficulties and requires the combined ingenuity of a prosthetic dentist as well as a surgeon who

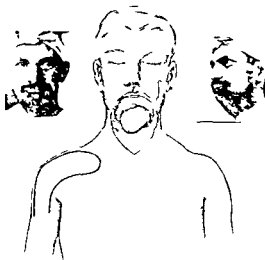


Fig 19—Case G. M. D. ru. fl. j. w. l. f. ploding  
ca. Loss f. b. t. et. d. d. f. m. l. m. l. d. t. back  
fl. t. m. l. th. h. d. f. m. ph. r. yn. t. base. f. t. gu. l. this case  
t. rat. f. th. soft. pa. compl. h. d. bef. th. tra. pl. tat. f.  
th. bo. by. m. f. pl. fl. p. t. k. f. m. th. h. ld. l. wn  
f. ll. w. g. d. gr. m.

not only is accustomed to deal with splint and mechanical problems but is competent in osteoplastic technique as well.

In extensive cases of loss of bone difficult plastic surgical problems present themselves. This work may require numerous operations to bring forth skin and soft parts from the sides of the neck or jaw to restore like tissues shot away or lost from infection. In the most massive cases extensive pedicle graft flaps from other portions of the body must be so fitted

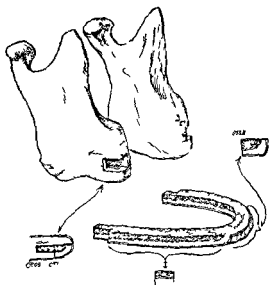


Fig 13 —Ca G M Show g th j w fr gm t pr pa ed fo th  
 r cept f th l g U h ped graft f m w g of l m wh ch sto d  
 th l f bt s l w jaw f m l t m l e d to b k of l st  
 m l o th th N t th h ld w l h w t the d f th  
 gr ft t ins t fit f tl graft w th th l t f agm t

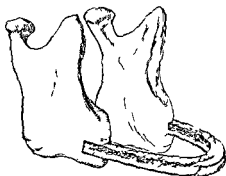


Fig 133 —Ca G M Sh gg ft f m l m pl th m  
 N t th t th h pe d t g th f th graft uffice tt fi d h ld th  
 j w fr gm t th d ed n r mal po t th p ve t g th dd ct o  
 of th fr gm t h h th e ld vitably lt



moment that the results of bone grafting in mandibular pseudoarthrosis are not yet demonstrated. They are *encouraging*—no more.

The above conclusions confirm a recent statement made to the author by a French surgeon who remarked that he had *never* seen a successful result from the osteopenosteal bone graft. The author takes exception to these foregoing statements inasmuch as he feels that the fundamental principles of the bone-



Fig. 131.—Case G. M. Sh. g. th. pl. t. fi. p. k. f. th. soft  
part. f. th. h. ld. h. h. h. be. tt. h. d. t. th. sof. pa. f. th. f.  
Th. rm. w. h. fd. mm. bl. d. by. pl. t. -of. f. n. h. d. ba. d. g. th.  
post. f. period. ff. eels. l. h. t. m. is. necessary. f. th. f.  
th. soft. part. and. h. t. bl. h. t. f. h. blood. pply. f. th. beeq. t.  
mpl. t. t. f. th. bo. graft. t. t. th. m. d. bl. \ sec. mo-  
bl. zat. f. th. part. m. t. mport. t. ll. ca. f. ped. l. graft. both  
t. lt. d. mif. t. f. h. pa. t.

graft have not been taken into proper consideration in planning the procedure or in executing the technic by a large number of those who have reported failures through its use. With proper primary technic a satisfactory percentage of good results should be obtained. The high vascularity of the soft tissue about the mouth is a most important feature since the success of the bone graft lies largely in the adequate blood supply, which is not satisfactorily provided for by any other technic.

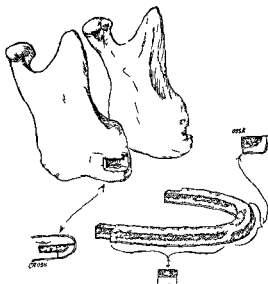


Fig 132—C G M Sh g th ; w f gm t p p d f th  
cept f th la g U h p d gr ft f w g f al um wh h t d  
th l as f b t l w ; w f m l a t m l o det b k of la t  
m l th th N t th b ld wh h w t th d of th  
g ft t t fit f th g ft w th th ho t f gm t

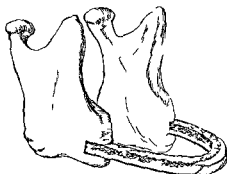


Fig 133—Ca G M Sh w i g g ft f m l m p l c e th mus  
N t th t th h p e d t g th f th gr ft fi t t fi d h ld th  
; w fr agm t th d d r mal po t th p e t g th dd ct  
of th f gm t h h th r w e w ld vit bly lt

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Fig. 131.—Case G. M. Sh.      g. th. pl. t. fl. p. t. k. f. m. h. soft  
part f. th. h. uld. h. h. h. be. tt. h. d. t. th. soft part f. h. f. ce.  
Th. rm. wa. h. ld. mm. bul. d. by. pl. t. -of P. h. d. ba. d. g. h.  
po. t. f. period f. f. e. ks. h. h. t. m. ec. sary f. th. f.  
th. soft parts d. th. establ. hm. t. f. h. blood. pply f. th. bseq. t.  
mpl. ta. f. th. bo. graft. t. t. th. m. d. bl. A sec. immo-  
bilizati. f. th. part. most mport. ll. se. f. ped. l. gr. f. bo. h.  
t. es. l. d. mf. rt. f. th. pat.

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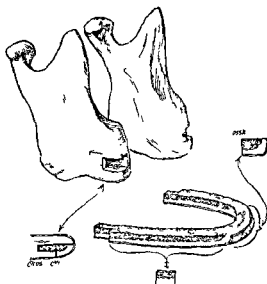


Fig 132—Ca G M Sh w g the j w f gm t p p d fo th  
cept f th la ge U haped graft f m w g f l m wh h sto d  
th l s f b t l w j w f r m l t m l d to b k f l t  
mol o th th N t th h ld wh h w cut the d f th  
graft t a te fit f th graft th th h t f gm t

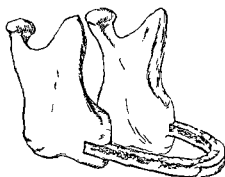


Fig 133—Ca G M Sh g g f t f m l m p l c e th m  
N t th t th h p e d t r g th f th graft f f i c i e t t o f i x d h l d th  
j w f r a g m t th d d r m a l p o t th p v e t g the d d c t o  
f th f r g m t wh h th r a s e l d t b l y l t

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Fig. 131—Case G. M. Sh. g. th. pl. t. fl. p. k. f. m. h. soft  
part. f. th. h. ld. b. h. h. be. tt. h. d. t. th. soft part. f. th. f. ce.  
Th. rm. a. h. ld. mm. bl. ed. by. pl. t. -of. P. ri. h. d. ba. d. ge. h.  
pos. t. f. period. ff. k. h. h. t. m. ec. ssary. f. th. f.  
th. soft part. d. th. tabl. hm. t. f. h. blood. pp. ly. f. th. b. seq. t.  
mpl. tat. f. th. bo. -graft. t. th. m. d. bl. A. se. re. mmo-  
biliz. at. f. th. part. m. t. mport. t. ll. se. f. ped. l. gr. ft. bo. h.  
t. lt. d. m. f. rt. f. th. pat. t.

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Fig 13 —C se G M Ph tog ph t h w t ct f l w r j w by  
bo e g ft d t k g a f f m ho ld



Fig 136 —C se G M Pl t f P ca t wh h w f i t m ld d  
f m th t l dt f j w th ca N t that th la t m l  
th right th ly tooth wh h ma d th l j w f l w g j ry  
from plod g ca (See rr w ) F m th pl t ca t pe al  
t d t l pl t wa d v ised by D Edw d K dy f N w Y k As  
h w th uppe m d l th ppe j w scaped j ry l th f l w g  
fig th t d t l pl t h wn j pl d





Fig. 13 —Case G M. Pharyngopharyngeal fracture of lower jaw by  
 blow from the fist, with fracture of the hyoid.



Fig. 136 —Case G M. Photograph of the jawbone, showing the fracture of the lower jaw by  
 from the fist, with fracture of the hyoid. The right side of the jawbone is shown, with the fracture line clearly visible. The jawbone is mounted on a metal stand, which is used for display and measurement. The image is dark and has a high-contrast, almost woodcut-like appearance.



peedily accurate cabinet fits by means of automatic power driven tools such as the author's bone mill

The osteoperiosteal type of graft in the years prior to the war had practically gone out of use for the reason that men had tried it and had failed with it. With the advent of the war there arose suddenly a large group of cases of loss of jaw

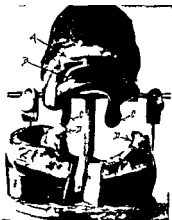


Fig 137—Case G. M. Th. pl. h. fitt d t th ppe j w  
 B. pert l ft th pl t th gh h h t be p ss d f l q d  
 f d g Th pl t ca t f th l j h pl t tw p rt be g  
 sepa t d f fici tly t rr t th dd f th j w fragm t Th  
 pl se f st d t th ppe t th th th fl ges h ld rs C  
 p j ct g d wn d h ma that h th pl t pl d  
 th ppe j w pp um d th th l h h uld rs m th  
 d f th d f th l j w f gm t D It d t h  
 p ss re f m th se h ld d th f th m m mb  
 ve ly g th d f th j f gm t d th pa th t t d th  
 m al f th pl t h case th f rty-eght h I h ld h  
 e be t d th t g t th type f gr ft mpl j d th j w fragm t  
 e h ld pl d dly f m al

substance of relatively short duration in which in addition to the profuse vascularity of the region there was no special reason for extensive loss of osteogenesis and under such conditions favorable to its use the osteoperiosteal graft yielded a fair percentage of results and its popularity especially in France became reestablished

Except in such cases as the foregoing osteoperiosteal graft should never be used alone. In fact the author never uses it under any conditions for it is not a complete osteo-vascular unit. The author prefers at all times his sliver graft (described elsewhere) as supplemental to the main fixation graft.

Again the sliver or the osteoperiosteal grafts are by no means adapted for cosmetic results in jaw work. Only by means of a strong graft molded for this principle and firmly inlaid into

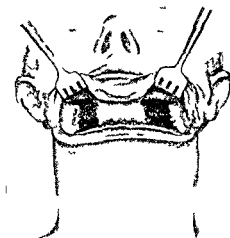


Fig 138—Case of ununited fracture of the lower jaw. The patient is shown with the jaw open, revealing the bone graft in place.

each fragment can restoration of the proper contour of the face be accomplished.

The author feels from experience with over 3000 free bone grafts on human subjects that the pedicle is neither necessary nor advisable even in the minority of cases in which this type of technic is feasible. It is apparent that in all cases where the loss of bone is extensive or when even a very little bone is absent if the pseudoarthrosis is situated at a point where the contour of jaw is angular the pedicle graft is not possible of application.



even span the hiatus let alone an overriding contact with the jaw fragments. The result as one would expect was a complete failure.

**Surgery of the Soft Parts**—Too much emphasis cannot be placed on the importance of following the multiple step method in dragging or displacing forward the skin and soft parts of side of face and neck. Formerly it was considered that this



Fig 140—Case of Ununited Fracture of the Lower Jaw. The patient is shown in a position for surgery.

displacement must be accomplished in one or two operative procedures. Striking results have been accomplished in most difficult cases by repeated operative procedures (multiple step method) in dragging the skin and tissues forward from the face or upward from the neck and suturing with a safe amount of tension. One or two weeks are allowed to elapse when at another operation it is found that the tissues are stretched and the tension has almost entirely disappeared. The skin and soft

From an exact mechanical standpoint the pedicle graft falls far short of the ideal (1) in that it cannot be obtained long enough to be inlaid or mortised into the jaw fragments even when there is not an extensive loss of bone (2) in that it is entirely out of the question where there is an extensive loss of bone (3) in that it does not offer possibilities of being molded to produce cosmetic results (4) lastly it does not furnish bone material of sufficient strength.

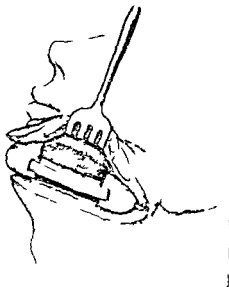


Fig. 139—Case C. H. D. m. t. h. l. y. g. f. h. l. f. d. pl.

In fact the inlay graft obtained from the tibia or ilium and molded by the mortar and pestle offers the only medium of securing satisfactory cosmetic results in certain cases. This is illustrated by a case of the author's—an officer in the United States Army—when a previous attempt had been made to restore  $1\frac{1}{2}$  inches of loss of bone of the right mandible by a pedicle graft. X-rays taken a few days after the operation disclosed clearly the inadequate nature of the graft. It was not long enough to

before resorting to a transplantation of skin and soft tissues from the neck and other parts. This is not however always possible and the Carrel Dakin or dichloramin T method of wound sterilization should always be instituted in the presence of a granulating wound before the transplantation is attempted. This may be carried on in the interim during the operative procedures : *e* while the skin is being dragged inward and upward.

If the patient is brought to the surgeon early within a few hours after injury a thorough debridement should be done and if possible the soft parts should be primarily sutured. This may be impossible either on account of the extensive amount of tissue lost or owing to the length of time which has elapsed since injury with the resultant infection of the tissues in which cases the Carrel Dakin method should be instituted immediately and as soon as the wound is surgically clean the procedures on the soft parts should be begun.

**Restoration of Bone**—The attempt to restore bone at the same time that the soft tissues are being supplied is never advisable the results are not so trustworthy. A satisfactory graft cannot be obtained from the clavicle as a rule for the bone is not of the right shape and is not of large enough diameter. Furthermore such a procedure is not so successful from the point of view of the growth of the bone graft. Once the soft parts have been established the graft material can be secured much more accurately and successfully.

The bone graft restoration should never be attempted until the wound has been completely healed. If infection has existed around the ends of the jaw fragments at any time a period of at least two months should elapse after complete healing before the bone graft is inserted. Plastic soft tissue work should have as its object the satisfaction of two essential pregraft requirements viz (1) to avoid or overcome the existence of skin scars adherent to bone in the immediate neighborhood of the proposed graft (2) to furnish a well nourished pliable soft tissue bed thick enough to receive the cosmetic molded graft.

Of all plastic work the restoration of bone in the jaw de

parts are then again undermined and still further displaced until the result desired is accomplished.

In cases where the loss of substance is so extensive that the multiple step method of displacing neighboring skin and subcutaneous tissue from neck or face is not adequate the transplantation of these structures from some part of the anatomy has been resorted to usually by the Italian plastic method. An ample amount of soft tissue can always be obtained from the top of the shoulder from various regions of the arm or by a



Fig. 141—Case C. H. B. f. d. ft. f. j. w. by bo.  
graft. Both bo. graft. t. ri. gl. f. bo. h. d. f. h. j. h. ve.  
becom. fi. mly. d. and th. j. ry. firm.

two step procedure from abdomen to arm and from arm to the jaw. This latter method requires two operations and has no special advantage over the direct method from shoulder or arm to jaw. Ample skin and soft part should always be obtained as they are liable to shrink.

It is absolutely essential that the soft tissue work be satisfactorily done so as to afford ample soft tissues to cover the graft and allow the contour of the jaw and chin to be restored before the bone work is attempted. It is preferable to approximate the skin flap of the neck and face and get union

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Fig. 141—Case C. H. B. f. d. ft. tru. f. j. w. by bo.  
gr. ft. B. th. bo. graft. n. g. l. ss. f. bo. h. d. f. th. j. w. have  
becom. f. m. l. y. t. d. d. h. j. ry. firm.

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the inferior maxilla its loose articulation its irregular contour and the difficulty because of its location of supporting it. Fragments of this bone always recede from the light blows of a chisel and mallet and are therefore most difficult to cut in that way) and third on account of the complicated irregular contour of the jaw and the difficulty of molding grafts by these means around curve etc.

Gillies<sup>1</sup> speaks discouragingly of using shaped block graft and states how laboriously they are fashioned by such hand tools and further says The method is very interesting and exceedingly good when successful. It is however much too difficult to perform and requires an operation lasting sometimes over three hours. The writer would certainly agree that any bone graft operation lasting three hours should not be done.

Gillies quote another experience which still further emphasizes the disadvantage of continuing to persist in using the chisel and mallet in this work. He states that a shaped graft taken from a brittle tibia broke to pieces before its shape was complete. In fitting in the remains into the recesses made for it in the fragments the fragments broke.

By the use of electrically driven automatic tool such as both single and twin saws of different sizes, drill burrs and end mulls of different size the difficulties just enumerated are largely overcome in such operations. The elimination of shock has also been striking owing largely to the speed and accuracy with which the work is done as well as their great efficacy in cutting through the hard bone which otherwise would be done slowly and laboriously by heavy blows of the mallet on chisel or osteotome.

Again an additional advantage of the rapidly revolving saw may be found in certain phenomena strikingly illustrated in the World War viz the laceration of non vital tissues by means of a slowly traveling (spent) projectile causes such a bombardment of the central nervous system by a storm of different afferent nociceptive impulses that the smitten soldier drops in his tracks.

mand the most exact and the most accurate cabinet maker work of any and as a consequence requires the use of electrically driven automatic machine tool or instruments.

Following the suggestions of Ollier some have inserted the osteoperiosteal grafts very thin and of no supportive value in pseudo-arthritis with or without loss of bone substance. They do not secure support and thus do not overcome the deformity. In such cases they are absolutely dependent on the dentist's fixation which he produces by the interdental splints (metal splints upon the teeth) in those cases where teeth exist on both jaw fragments. In those cases where these conditions do not exist the interdental splint is of no service.

Again the great disadvantage of this method has been especially emphasized in the author's experience in cases where the patient has been unable to tolerate the splint. In one case it was removed after twenty-four hours because of pressure necrosis of the alveolar process. This case could have been a failure if osteoperiosteal grafts had been used. As it was the strain on the fixation graft held jaw fragments firmly and the result was most satisfactory. Osteoperiosteal grafts should be used only as supplements to a fixation graft.

When the requisite portion of the face is completely covered healing of the soft parts must be waited if there has been no previous infection the bone work may be done two or three weeks after healing of the tissues. With the blood supply well established in the soft parts the bone graft operation is performed. Owing to its high vascularity the face is one of the most favorable regions in the body.

In jaw work motor tools and machinery of the various technic are more important than in any other class of work and are practically indispensable.

Attempts to cut mold bone of the lower jaw by ordinary surgical hand tool such as the osteotome, chisel and mallet is much more difficult than in any other similar work and is practically impossible. In most account of the hardness of the bone second on account of the absence of an stability to the impact of chisel and mallet (chisel does not the light weight of

extreme thinness of its cortex and the spongy nature of the interior of the rib

The breadth of the tibia though adequate in a large variety of cases for graft dimensions is not large enough to allow the molding of grafts of wide curves sometimes needed in cases of extensive destruction of the lower jaw. In the latter instance the author has resorted to the removal of the graft from the next most favorable bone namely the wing of the ilium which is the broadest bone in the body. This bone is most favorable and will allow the molding of grafts of extreme curves.

The ilium is particularly accessible by the *Sprengel Smith Peterson* means of approach the only difference being that the periosteum should *not* be removed with the muscle as it is desirable to have it remain on the graft. Grafts U shaped in general contour and large enough to restore a large portion of the jaw (from an *le* to angle) have been obtained from this bone.

The graft serves the following purposes first it furnishes an active bone growing bridge of bone when accurately incorporated as an inlay in both fragments second it serves as an internal fixation splint third the marrow substance in the graft serves as a vascular conducting medium from the cancellous tissue of the one jaw fragment to that of the other—this is an important function in that the blood is brought from the healthy vascular cancellous bone back of the eburnated end of the fragments to the region of bone proliferation. This function of the graft is often overlooked and the technic is therefore not planned to bring it about. It is essential for all tissue proliferation that sufficient nourishment be brought to the part containing the cells which are to proliferate. Fourth it serves as a bony framework for the overlying soft parts and it is through the proper molding of the graft that the symmetry of the face may be restored.

Cosmetic results in the type of cases given above cannot be accomplished by means of the osteoperiosteal or the pedicled graft. The osteoperiosteal method is inadequate—the graft has no strength nor supplies mechanical support. Men have accepted

in a profound state of shock. On the other hand when these same tissues are severed by a projectile traveling at high velocity (providing the vital centers are uninjured) the soldier walks on with scarcely any evidence of vasomotor disturbance. In the latter contingency the nervous end-organs are severed by a cutting agent traveling at such speed that the nerve filaments are unable to delug the central nervous system with a wave of afferent nociceptive impulses because they are incapable of taking up such stimuli as is produced by a severing agent traveling at such speed. An analogous set of circumstances likewise involves a severance of nerve-endings—by a slowly revolving saw or chisel on the one hand and a rapidly revolving saw on the other.

The author, of necessity, began his early bone grafting operations with hand tool and after he had developed his motor-driven instruments he found that shock had almost entirely disappeared in the course of operations of reasonable length. He is uncertain as to whether this absence of shock is to be attributed to Crile's theory of anoxia association or to a shortening of the time of operation brought about by motor-driven tool.

The author has frequently and purposely put in a graft whose diameters were larger than necessary and after being fixed in place by the kangaroo ligatures the external contour was molded in symmetry to the other side of the facially shaping it with the author's rotary motor saw. The soft parts being temporarily approximated over it as a framework for the purpose of matching the contour of the other side of the face by trial. By this method a very satisfactory cosmetic effect has been frequently secured.

**The Sources of Graft.**—As a rule the author prefers the tibia as source of the graft. Its bone cells are more active osteogenetically than any other. Moreover its cortex is very dense and strong and when molded into the shape of curve always necessary in jaw work it retains its characteristic strength. This is in special contrast to the bone of the rib (so frequently indicated as a graft for the jaw) which becomes very much weakened as soon as efforts are made to trim it or to mold it thus losing its tubular strength. This is of course due to the

(3) To aid in the immobilization of the jaw fragments at the time of the bone graft operation and during the convalescence

It may occur that the splint cannot be tolerated by the patient or that the extensive loss of teeth make it impossible to attach it. In this connection great emphasis should be laid on the importance of the accurate insertion and fixative effect of the graft whereby in such an event it alone may be capable of furnishing adequate support and fixation of the jaw fragments. The removal of the dental splint two weeks before operation is advisable in order that a careful toilet of the mouth may be made and to permit movement of the fragments for the purpose of stirring up infection if a latent infection exists. If this should occur a splint is reattached and there is a thorough cleaning of the cavity and the plastic bone operation is deferred for two or three months after complete healing.

If there is no infection operation may be done in two weeks. Whatever displacement may occur can be readily corrected at the operation as the time is not sufficient for a contracture.

**Operation**—A general anesthetic is practically always necessary in such cases and should be given through nasal or pharyngeal tubes.

The skin incision should be so placed that the graft may be covered and embedded if possible in normal vascular blood carrying tissues through whose medium nourishment must be brought to the graft. Scar tissue not only is devoid of blood vessels but it is liable to break down and slough. In cases with dense scar with or without possibility of danger or exacerbation of latent infection the bone graft operation may best be done by two steps. The first operation in this case consists of removal of the scar tissue and its replacement by a plastic flap of healthy skin and subcutaneous parts sufficiently thick and of suitable character to receive the graft. If primary union occurs the bone work usually may be done at the end of two weeks.

After the bone is laid bare every effort should be made at all times to avoid entering the oral cavity. Incision should be made low over the margin of the jaw to avoid this as the mouth is full of bacteria. If the mucous membrane is punctured it

and used such methods without any idea of shaping the symmetry of the face apparently either because they do not wish to equip themselves adequately to do the work or they do not care to go to the trouble of perfecting themselves in the motor mill technic. The comparison between doing this work in the latter way or by a chisel and mallet is about the same as riding in an automobile or walking.

The technic employed by some in the osteoperiosteal graft is as follows: the ends of the cut bone fragments are laid bare and the periosteum is peeled off. These tissues are often found devoid of adequate blood supply and furnish a very poor environment for the graft which is merely, as a rule, laid on the fragment ends spanning one half on one end and one half on the other. The cancellous tissues are not tapped and the blood supply is sure to be meager.

It is always necessary with such grafts to supply all support and fixation by interdental splints and if they prove to be inadequate or intolerable to the patient, as in one of the author's cases, and their too early removal necessaries, the result is seriously jeopardized. Whereas if the graft of the inlay type and well mortised it will furnish sufficient fixation, as it did in the author's case just mentioned. In fact, many cases with extensive loss of bone have been successfully operated without being able to employ the dental splint as a supplementary fixation.

**Ideal Management of a Case with Loss of Bone Substance —** Prophylaxis is the ideal treatment of malposition of jaw fragments after loss of bone substance. Dental splints should be applied when possible by competent prosthetic dentists in cooperation with the surgeon at the earliest possible moment.

The functions of the interdental splint are:

(1) To prevent the occurrence of faulty alignment of the jaw fragment and to correct already existing contractures and displacement of the jaw fragment (such as swinging to one side when the effect of bone by the action of unopposed muscles and soft parts).

(2) To maintain the operative correction of alignment of the displaced fragments.

(3) To aid in the immobilization of the jaw fragments at the time of the bone graft operation and during the convalescence

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**Ideal Management of a Case with Loss of Bone Substance —** Prophylaxis is the ideal treatment of replacement of jaw fragments after loss of bone substance. Dental splints should be applied when possible by competent prothetic dentists in cooperation with the surgeon at the earliest possible moment.

The functions of the interdental splint are

(1) To prevent the occurrence of faulty alignment of the jaw fragments and to correct already existing contractions and displacement of the jaw fragments (such as swings over to one side when there is loss of bone by the contraction of unopposed muscles and soft parts.)

(2) To maintain the operative correction of alignment of the displaced fragment.

a drip of saline solution is furnished to the saw. The motor saw should be allowed to travel its whole width into the marrow cavity before it is pushed along the length of the bone so that contact with the marrow may furnish a lubrication to the saw. The drill holes for the kangaroo tendon (as shown in Fig. 122) are put in after forming the gutter. The kangaroo tendon is already in the drill holes before the graft is obtained. When the graft is removed the kangaroo tendon is lifted up by some long instrument and the graft is slipped through under the kangaroo tendon and the tendon is then pulled down over the surface of the graft. The graft is then forced into place by means of an Ochsner clamp. The kangaroo tendon is tied. The second half knot is locked by tying No. 1 chromic catgut about it.

The deeper structures are pulled over the graft by a curved needle with No. 1 chromic catgut. The skin is closed by small sutures of fine silk. A large dressing is applied with a bandage over the top of the head.

The patient is fed by a tube immediately after the operation.

The following are illustrative cases.

Case S. I. illustrates those in which massive grafts are absolutely necessary to bring about cosmetic results. This young man, eighteen years of age, presented an uneventful history. He had always had a markedly receding chin without known cause. This was especially annoying to him in that his father had an unusually prominent lower jaw. He felt sure that this defect in his physiognomy would lead individuals in his future business career to distrust his ability to make a decision and stick to it. His family felt that it had become essentially a fixed idea with him and thought if the chin could be safely lengthened by a surgical procedure it should be done. Therefore this young man was operated on at the New York Post Graduate Hospital on July 20, 1922, and a graft from the upper third of the right tibia, including the crest and about 1 $\frac{1}{2}$  inches long,  $\frac{1}{2}$  inch wide and  $\frac{1}{4}$  inch thick, was placed on the anterior prominence of the lower jaw as shown in Figs. 102-116.

The following 2 cases are illustrative of those difficult cases in which dental splints, osteoperiosteal and pedicle bone grafts

must be sutured with great care so as to avoid air being forced through during coughing or sneezing and the infection be driven deeply into the wound with the air.

The ends of the jaw fragments are developed by sharp and blunt dissection. The author's twin saw is then adjusted in accordance with the width of these fragments and cuts are made back from the fragment ends for a distance of as nearly  $1\frac{1}{2}$  inches as possible. The ends of the strip of bone between the saw cuts is then severed on each side by means of the small cross cut saw or with the end of the motor drill. With a sharp thin narrow osteotome the strip of bone between the above mentioned saw cuts is then removed. If the bone is hard this may even be found difficult and the small motor saw or burr of Blake's end mill may be used to complete the formation of the gutter.

By means of a flexible lead bar or probe which is laid in the groove for the purpose of obtaining the exact contour of the proposed graft the blades of the twin saw used for making the gutters in the jaw fragments are then additionally separated a little less than twice the thickness of the blades or twin saw *B* (Fig. 124) is so adjusted that twin saw *A* (Fig. 124) which has been used to form the gutter in the jaw fragments will just engage in between the saw-cuts in *B* (Fig. 124) the object being to avoid the gutter made by the twin saw unadjusted being twice the thickness of a saw blade wider than the graft removed by the same twin saw unchanged. By adjusting the twin saw in this way or by using two twin saws a much closer fit of the graft is secured.

The graft is obtained from the upper portion of the antero-internal surface of the tibia when possible and the next best source is the wing of the ilium. This is the best position of the bone as well as having a thinner cortex which is more in keeping with the thickness of the bone in the jaw. The flexible probe or lead bar is laid upon the flat surface of the tibia and with the scalpel using the twin saw as a guide the proposed graft is carefully mapped out in the psoas.

The graft is then removed by means of the twin saw while

Now almost two years after the plastic operation the patient comes to this country specifically for operation on the lower jaw for functional result primarily and cosmetic at the same time if possible.

The patient on examination presents an irregular scar in submental and thyroid regions. The mentum of the lower jaw is retracted. There is practically no control of the remains of the lower jaw.

When questioned the patient complains of difficulty in breathing in all positions especially when on his back. There is also difficulty in swallowing even fluid and that primarily was the only type of food he could take. His speech was very poor.

On examination it was found that portions of both rami were absent. A island of mentum with 3 teeth was intact and could be drawn forward into practically normal position in reference to the upper jaw alignment. The mandibular joints were intact with fragments of rami just below the angles. The gap on the left side was the greater of the two measuring about 1 1/2 inches. The right side gap measured about 1 inch.

An open operation was performed inlay bone grafts obtained from the left tibia were fixed in position with kangaroo tendon sutures. The island of jaw mentum with 3 teeth was thick rigidly fixed in proper position. At the same time pressure on larynx was relieved the base of the tongue was pulled forward. It was impossible to use any interdental splint because of lack of teeth in the posterior fragments.

Three days after operation patient noticed that breathing and swallowing were much easier than heretofore. Temperature came down to normal and has remained so since. Two weeks after operation the wound was healed by primary union. No dressings or external means of immobilization was used. The patient at this time is very happy feeling very well relieved of all symptoms as to difficulty in breathing and swallowing. Breathing normal in all positions speech is much clearer. Soft food was taken soon after operation without difficulty. The cosmetic result is good.

are not possible of application. It illustrates further the mechanical immobilizing and cosmetic possibilities of the inlay graft when employed in the most difficult cases of loss of substance of the lower jaw and inserted according to the author's inlay method and by means of automatic electrically driven instruments.

C. H. Age thirty-two years. Russian male (Figs 138-147).

History.—Two and a half years ago while in Russia patient was shot by bandits. He sustained an injury to the lower jaw. The shrapnel the causative factor destroyed the greater part



Fig. 14.—Case C. H. Before and after treatment of both sides of jaw by bone graft. An operation in that case. Case S. I. before and after in the case of cosmetic purpose only.

of both ramus of the lower jaw. The submental and sublingual tissues were markedly lacerated. The wound was infected and drained for over four months.

After the wound had granulated in an operation on the soft tissues was performed in a Moscow hospital. This operation according to the story of the patient improved his looks markedly. No improvement in function of the lower jaw followed however. An attempt was made to improve the bony framework.

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typical hour glass contraction of the stomach—the result of a penetrating ulcer of the lesser curvature—was found (Fig 143) the constriction being at about the middle of the stomach. The channel connecting the pouches is very narrow so that at the end of six hours—as you will see by the films—there is still retention in the upper pouch. You will also notice in this film that a large amount of the barium mixture remains in the lower



Fig 143—Film of stomach

pouch indicating stenosis at the pylorus (Fig 144). At the end of seventy-two hours the barium is still in the distal pouch. Delay in emptying time is not always caused by an actual stenosis at the pylorus but may result from interference with the motility of the stomach. In any event it is a factor that must be given serious consideration before coming to a decision as to the best operative procedure to adopt in a given case. We have therefore to deal with an emaciated dehydrated

patient weighing only 45 pounds suffering from hour glass contraction of the stomach with retention in both the cardiac and pyloric pouches. It might be well at this point to refer briefly to the pathology as usually found in these cases. To begin with for a considerable period of time years perhaps before coming under observation there is the history of an active ulcer which after a longer or shorter period of time slowly penetrates the stomach wall and becomes adherent to the under surface of the liver or the pancreas. The great majority of these ulcers are



Fig 144—Stomach with hour glass contraction and retention in both pouches

situated on the lesser curvature or posterior wall. The x ray findings in penetrating ulcer are characteristic. Apparently after the ulcer perforates there is often a tendency for it to heal spontaneously and it is in this effort at healing that the contraction takes place. The contraction is always in the transverse diameter of the stomach and at the expense of the greater curvature. The symptoms of ulcer are replaced by those due to obstruction and at operation extensive adhesions and scar tissue may be all that is left to show of the ulcer.

In coming to a decision as to the type of operation best suited for the case before us two important factors must be taken into consideration. The first is that the patient is in very poor condition and for this reason the simplest and quickest operation that will meet the indications must be performed. The second fact to be considered is that there is an obstruction at the pylorus as well as at the point of constriction therefore both pouches must be drained in order to obtain a satisfactory result. After a study of the findings and a careful examination



Fig 145—Right distal pouch type of horseshoe

of the films I have about reached the conclusion that gastro-gastrostomy combined with pyloroplasty will meet the indications and should probably be the procedure of choice. This decision is arrived at because the pouches are large and if the x-ray interpretation is correct is close to the furthermore the operation can be done in the shortest possible time. The only other procedure that will drain both pouches is a double gastro-enterostomy and I am sure that technically it would prove much more difficult than the operation I have in mind.

Midgastric resection would probably prove too formidable an operation on account of adhesions to the liver and besides a pyloroplasty would have to be added. As a rule I do not favor the idea of planning intra abdominal operations before the lesion is exposed as the judgment of the operator may unconsciously be prejudiced thereby however when the patient is in such poor condition as this one is it may be of help to have at least a working plan to go by. We now proceed with the operation and you will notice as the abdominal wall is retracted that the midportion of the stomach is contracted and drawn up under the left lobe of the liver. There is a hard firm mass of adhesions extending over an area of from 2 to 3 inches. The entire circumference of the stomach wall is involved in this cicatricial mass and there is a narrow channel—say 2 inches in length—connecting the two pouches. You will further notice that the pouches are freely movable and that the walls of the stomach on either side of the constriction are free from induration. It will be a very easy matter to anastomose these pouches whereas resection of the constricted portion of the stomach including this cicatricial mass would be an operation of considerable magnitude. We now examine the pylorus and find firm adhesions to the gall bladder and under surface of the liver. There is no evidence of ulcer at this point but the pyloric ring is hard and narrow admitting the tip of the finger with difficulty. The duodenum is unusually mobile. A pyloroplasty is definitely indicated.

As the first step in the gastrogastrostomy we place a loop suture at the most dependent points of the adjoining surfaces of the proximal and distal pouches. You will observe that these sutures are placed well down in the incisura and catch the stomach at the margin of the greater curvature. Two similar sutures are placed about  $3\frac{1}{2}$  inches higher up that is almost at the apex of the incisura. As traction is made on these sutures the pouches become approximated. Their peritoneal surfaces are now united by a continuous suture of silk for a distance of 3 inches. A second row of fine chromic catgut is placed posteriorly. The pouches are now opened for a distance of  $2\frac{1}{2}$  inches by parallel incisions

placed about  $\frac{1}{4}$  inch to either side of the suture line. You observe that we are not using clamps in this operation. The bleeding points which are very few are quickly picked up and by the use of the suction apparatus there is little or no soiling from the stomach. The posterior edges of the cut surfaces are now united by a through and through continuous suture of chromic catgut which is continued as a self inverting stitch all the way around in front to the point of beginning thus completing the stoma. The original silk suture is now continued along

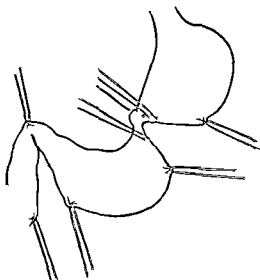


Fig 146—Showing tract and place

the front of the wound to the starting point. Several interrupted sutures are taken to reinforce the line of continuous suture (Figs 146-150). Having completed the gastrogastrostomy we turn our attention to the pylorus. A few months ago I had the privilege of seeing Dr. Finney perform a pyloroplasty according to his method and was so much impressed that I began using the method in every suitable case. Heretofore in doing this operation I had attempted to modify this method and was not always pleased with the result. Now however

since following Dr. Finney's technic I have found the operation much easier to do and the results perfectly satisfactory. This is an ideal case for the Finney operation. The first step is to free the pyloric end of the stomach and the upper portion of the duodenum of all adhesions. You will notice that we are able to mobilize these structures freely. A guy suture is now taken at the highest point in the pylorus and similar sutures are placed at opposite points on the stomach and duodenum about 7½ inches below. By making traction on these sutures—the

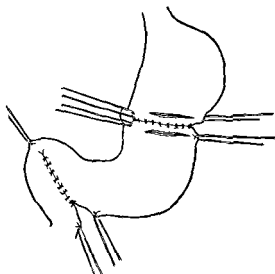


Fig. 14.—Posterior view of stomach and duodenum.

one above and two below—the adjoining surface of the stomach and duodenum are brought to ether and while held taut their peritoneal surfaces are united by a continuous suture of silk, keeping as far posterior as possible. We now place the mattress sutures which are to be used later in closing the anterior part of the incision. These sutures extend well out on the walls of the stomach and duodenum, are cut long, the ends caught with hemostats and left untied for the present. Eight of these sutures will be enough in this case. They are now separated

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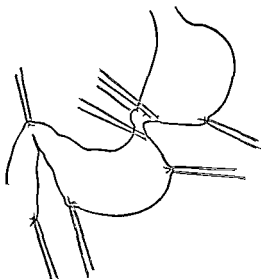


Fig. 146—Showing tract to place

the front of the wound to the starting point. Several interrupted sutures are taken to reinforce the line of continuous suture (Figs. 146-150). Having completed the gastrotomy we turn our attention to the pylorus. A few months ago I had the privilege of seeing Dr. Finney perform a pyloroplasty according to his method and was so much impressed that I began using the method in every suitable case. Hitherto in doing the operation I had attempted to modify it somewhat and was not always pleased with the result. Now however

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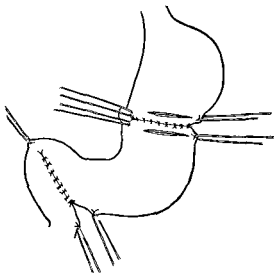


Fig 147—Pyloric end of stomach and duodenum

one above and two below—the adjoining surfaces of the stomach and duodenum are brought together and while held taut their peritoneal surfaces are united by a continuous suture of silk, keeping as far posterior as possible. We now place the mattress sutures which are to be used later in closing the anterior part of the incision. These sutures extend well out on the walls of the stomach and duodenum, are cut long, the ends caught with hemostats and left untied for the present. Eight of these sutures will be enough in this case. They are now separated



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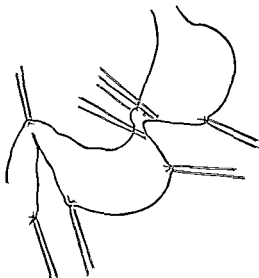


Fig 146—Stomach sutures in place

the front of the wound to the starting point. Several interrupted sutures are taken to reinforce the line of continuous suture (Figs 146-150). Having completed the gastrotomy we turn our attention to the pylorus. A few months ago I had the privilege of seeing Dr. Finney perform a pyloroplasty according to his method and was so much impressed that I began using the method in every suitable case. Heretofore in doing the operation I had attempted to modify it somewhat and was not always pleased with the result. Now however

isfactory As soon as she is returned to the ward she will be given 500 c c of a 5 per cent glucose solution under the skin and in about three hours the Murphy drip will be started In twelve hours small amounts of water containing bicarbonate of soda will be given by mouth and fluids gradually increased as indicated

Discussion—We do not see as many cases of hour glass contraction of the stomach as we did some eight or ten years

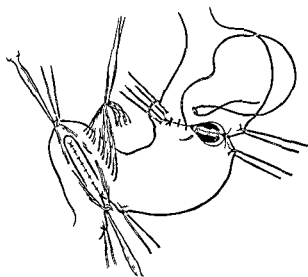


Fig 149—Cl f t port f st m bet po h M t  
t t p t d t o port O tl f U h ped t  
pyl ru

ago due no doubt to the fact that since the advent of the x ray the diagnosis of ulcer is made and treatment begun much earlier The incidence has been reported as from 3 to 10 per cent in different clinics The former figure more likely represents the occurrence of the condition at the present time Years ago there was considerable discussion as to whether hour glass stomach was not of congenital origin however it is now generally agreed that practically all cases result from ulcer of the body

into two parts—four being drawn up above the upper guy stitch and four downward below the lower stitches. An inverted U shaped incision is now made in the exposed area starting on the stomach side about  $\frac{1}{2}$  inch from the posterior continuous suture (inside the row of mattress sutures) and carried around through the pyloric ring and down on the duodenum for a similar distance. Each limb of this incision should be about 2 inches in length. The posterior cut surfaces of stomach and

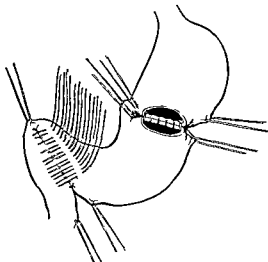


Fig 148—Posterior duodenal pyloric ring. Mattress-stitch

duodenum are now united by a continuous through and through suture of chromic gut beginning at the upper angle and continued down and well around the lower angle. We now release the mattress sutures and as they are drawn tight and tied observe how nicely the edges in-vert. A running suture is taken to reinforce the mattress sutures (Figs 146-150). We are now ready to close the abdomen. The operation has taken something less than an hour and there has been practically no blood lost. The anesthetist states that the patient's condition is very satisfactory.

formation of scar tissue with its resulting stricture and the late period in which the most important indication is to relieve the symptoms arising from obstruction. If the ulcer or the cicatrix of a healed ulcer can be excised at the same time so much the better. Resection of the body of the stomach—the so called sleeve resection—is the ideal operation for hour glass constriction as it meets all the indications. It is applicable to the cases with a patent pylorus in which the adhesions are not too extensive and the pouches fairly equal in size. As it may be a long operation it should not be done if the patient is in poor condition.

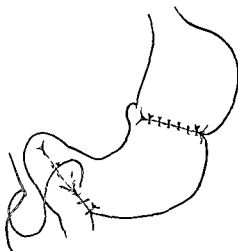


Fig 151—Method of resection of the stomach

We have performed this operation six times with one death. The death occurred from pneumonia on the sixth day in a patient in very poor condition upon whom a less severe operation should have been performed. This was the only death in our series. The clinical results from this operation have been extremely satisfactory. One of the patients remains perfectly well after nine years. In no case has there been a tendency for the contraction to reform. Judd has recently reported excellent results from this operation at the Mayo Clinic. In cases in which the ulcer remains active where there is a small pyloric

of the stomach. The condition occurs in women much more frequently than in men and there is always a history of long standing stomach trouble. Frequently all active symptoms have subsided and there may be a considerable period of comfort with improvement in general health before the symptoms due to obstruction arise. The outstanding feature in most cases is the extreme loss of weight. The diagnosis at the present time is made entirely by the x ray where as formerly various methods

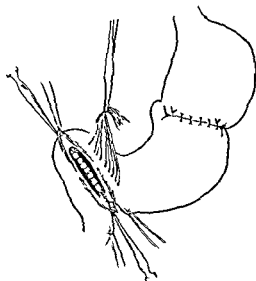


Fig. 150—Gastric myoelectric pyloric edge of stomach  
dilatation in nodules

of determining the position and nature of the lesion with careful examination of the returns were the only means at our disposal. It can easily be seen that the diagnosis was not often made before the x ray came into general use. The treatment of hourglass contraction of the stomach (and we are now discussing the cases in which the condition is a peptic ulceration) may be divided into two periods—the early or pre-operative period, which the ulcer is removed either by excision or the cauterization thereby avoiding the

that it removes the ulcer as well as all cicatricial tissue and restores the stomach to a more nearly normal condition than any other operation. The method has definite limitations however which should be remembered. For instance it should not be used if the patient is a poor risk nor should it be attempted if there is wide separation of the pouches or marked inequality in their size. Gastrogastrostomy and gastro enterostomy meet the immediate indications that is overcome the obstruction but have the disadvantage of not removing the ulcer or cicatricial tissue however this is not always necessary and may even be unwise in many cases. The former is the simplest operation that can be used and should be adopted in all cases in which time is an important element provided the arrangement of the pouches will permit. In the cases in which the channel is long separating the pouches by considerable distance gastro-enterostomy is the operation of choice. If there is retention in the pyloric pouch pyloroplasty should be added to either gastro gastrostomy or gastro enterostomy.

Eighteen out of the 22 patients included in this report have been followed for periods of from eight months to fourteen years.

Note—Mr. S. C. made an uneventful recovery and was discharged to a convalescent home on the twenty eighth day.

pouch partial gastrectomy according to the Polya method may be adopted. None of our cases were operated by this method. Gastroplasty was employed four times. In 2 of the cases an ulcer was excised and in 1 it was cauterized. Gastro-enterostomy was added in one case. The results from this operation have not been satisfactory. Two have returned with symptoms requiring a second operation. I feel sure that gastro-enterostomy should be added in every case in which an ulcer is excised from the lesser curvature. Gastro-enterostomy alone was the procedure adopted in 7 cases. This operation was employed in the cases in which the constriction extended over a wide area resulting in considerable separation of the pouches. The results were very good in all except one case. This patient returned in two years complaining of pain and discomfort. X-ray examination showed marked retention in the distal pouch. Pyloroplasty was then added with complete relief. One of these patients died of aortitis in this hospital one and a half years after operation. In performing gastro-enterostomy it is important to make certain that the anastomosis is made to the proximal pouch. At least 6 deaths have been reported in which it was found that the mistake had been made of uniting the intestine to the pyloric pouch that led to the obstruction. I have had no experience with double gastro-enterostomy. In a case in which the pouches are large enough and sufficiently mobile to permit of this operation it seems to me that gastro-enterostomy is preferable addition to pyloroplasty if indicated.

Gastro-enterostomy was performed in 5 cases with excellent results. My first case of hour glass constriction operated by this method over fourteen years ago remains well. This operation is suitable for all cases in which the pouches are fairly large and can be easily approximated and especially indicated if the patient is in poor condition and where haste is an important factor. Pyloroplasty should be added if there is retention in the pyloric pouch.

Briefly from my experience I would say that in properly selected cases of duodenal or ileocecal retention the operation of choice for the treatment of hour glass constriction for the reasons

## CLINIC OF DR. R. W. BOLLING

ST. LUKE'S HOSPITAL

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### COMPLETE EPIPHYSEAL FRACTURE OF THE HIP

THE first patient whom I wish to present to you today is a boy of fifteen who was admitted to St. Luke's Hospital two days ago with the following history. About five months ago he began to have pain in his left hip severe enough to cause him to limp. This pain resulted in his seeking medical advice and for two months he was treated by massage. No roentgenogram was taken. The pain disappeared and he was all right until three weeks ago when it recurred and became progressively worse. The day before admission he was able to walk though with difficulty. The following day however he could not walk at all and was brought to the hospital in a car. The only history of trauma which I have been able to elicit is that on several occasions one or another of his comrades struck him in the region of the hip with his fist. The family and personal history is entirely negative save for the fact that seven years ago he had infantile paralysis and two years ago an abscess in the ear.

The physical examination shows a moderately well developed and nourished lad apparently sound in every way save for the condition of his hip. The result of the various laboratory tests has no bearing on the condition.

When we examine the left hip we find the joint practically fixed by muscular spasm, the thigh adducted, rotated out, and an actual shortening of about 2 cm. The roentgenograms show a complete epiphyseal fracture at the hip (Fig. 152).

The rational method of treatment for this condition is reduction of the deformity by the abduction method and fixation

Service of Dr. William A. D. n





## CLINIC OF DR R W BOLLING

### ST LUKE'S HOSPITAL

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by means of a plaster spica from the nipple to the toes. Under ether anesthesia the pelvis is fixed by wide abduction of the sound limb and then the limb on the injured side is gradually abducted as widely as possible. As this maneuver is carried out you will note that before the widest possible range is obtained there is considerable resistance which I attribute to the fact that the abductor muscles have become somewhat contracted. I shall not now attempt to gain wider abduction but if the



Fig 152—Case I. Complete physiol. fracture of the hip.

roentgenogram does not show proper reduction I shall make another attempt.

The patient as you see is on the Hawley table and after having gained by manual manipulation the position which I wish to maintain I fix the limb in this position the thigh extended widely abducted and rotated inward and proceed to the application of the plaster spica extending from the nipple line to the toes.

I should like to emphasize the point that I find the fracture

table of great assistance in maintaining the patient in the proper position for the application of the spica but that the actual reduction of deformity should be done by hand with the aid of an assistant who manipulates the sound limb

Having obtained satisfactory reduction I will maintain fixation for about three months Following this massage and exercises will be instituted and the patient will be required to wear a Thomas splint for several months longer

Doctor Royal Whitman<sup>1</sup> has recently directed attention to



Fig 153—Case I. Complete epiphyseal fracture of the hip. Redacted.

the incomplete epiphyseal fractures at the hip in adolescents In view of the history of this patient it seems to me reasonable to assume that following some trauma which he cannot now remember there was an incomplete fracture at the epiphyseal junction of the hip that for some reason the process of repair checked the increase of deformity for a time and that following some further slight unnoticed trauma there was a further gradual displacement of the head upon the neck during the three weeks immediately prior to his admission to the hospital and that his

admission to the hospital was determined by the complete giving way of the weakened epiphyseal junction. Had a roentgenogram been made during the earlier stages it would doubtless have revealed the condition and indicated the treatment.

Note —Figure 153 is a roentgenogram made the day following and shows a satisfactory reduction of the deformity.

## PARTIAL DISLOCATION BACKWARD OF THE LOWER EPIPHYSIS OF THE FEMUR

IN connection with the last patient I wish to show you this little girl of seven who was admitted to St Luke's Hospital on July 3 1922. Three weeks before admission a large sign was blown against the patient's left side. Immediately following the injury the child was able to walk a short distance though suffering great pain in the left knee. For three weeks she received medical attention at home being confined to bed during that period.



Fig 154—Case II P rt l d  
locat f th l f m l p ph  
y th w k ft j y

Fig 155—Case II P rt l d  
l t f th l w f m l p ph  
y tw l w k ft j ry

On admission to the hospital there was diffuse swelling of the left knee and on the outer aspect of the joint there was evidence of old ecchymosis and a healed abrasion. There was a small amount of fluid in the joint. Extension was limited. A roentgenogram made at this time revealed a partial dislocation backward of the lower epiphysis of the femur (Fig 154).

After careful consideration it was decided not to attempt to reduce the dislocation in view of the length of time following

the injury. After a few days in bed at the hospital it was found that the knee could be almost completely extended and a light circular plaster case including the knee was applied. This remained on for two weeks when it was removed. Following the removal of the case massage was instituted. Two weeks later a marked synovitis of the left knee developed and it turned out that the young lady had been getting up out of bed and walking whenever opportunity presented. The only treatment of

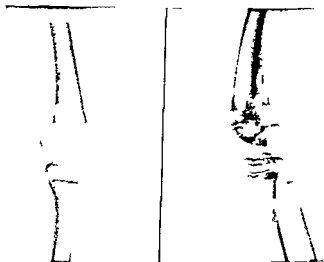


Fig 156—Case II. Part I. Location of the femoral physis. Malformation of the femoral physis.

the condition was a cotton dress in firmly bandaged and the incontinence of the patient's remaining in bed. The fluid in the joint disappeared in about two weeks and two weeks later the child was allowed to walk and a discharge from the hospital nine weeks later demonstrated a retrograde motion of the time (Fig. 155) showing the improvement in position.

It now months since her injury. The child has perfect function. There is no deformity, no shortening can be made out and the osteogram (Fig. 156) shows that the distal

ment has disappeared. It is of course too early to state that there will be no interference with growth but certainly there is no evidence of such interference at present and no suggestion of premature ossification.

This patient illustrates the wisdom of conservatism in the treatment of certain cases of partial dislocation of an epiphysis seen for the first time several weeks after the injury and where an open operation is the alternative. I believe this to be notably true in the case of the lower radial and lower femoral epiphyses. In recent cases of course every effort should be made to reduce the deformity. Certainly in this particular instance no more satisfactory result could have been obtained by any method of treatment.





## SUBASTRAGALOID DISLOCATION OF THE FOOT BACK WARD AND DOWNWARD

THIS patient is shown to you as an end result on account of the rarity of the condition and the practically perfect functional result following a very severe injury

C S K Hospital No 18 212 age twenty seven was admitted to St Luke s Hospital on October 19 1919 On the day before admission the patient was riding in an auto and in some way his right foot was caught between the side of the rapidly moving car and a tree The exact mechanism of the injury could not



Fig 157—Case III Subastragaloid dislocation of the foot backward

be made out I saw him about thirty six hours after he had been injured

The foot was enormously swollen ecchymotic and covered with blebs The skin on the dorsum was very tense and on account of the great swelling I was unable to make a diagnosis of the exact character of the injury

The roentgenogram (Fig 157) revealed a subastragaloid dislocation of the foot backward and downward with a fracture

of the anterior portion of the calcaneum and of the posterior process of the astragalus.

Under ether anesthesia a vertical incision was made over the center of the dorsum of the foot the anterior portion of the projecting astragalus exposed together with the posterior portion of the scaphoid. The soft parts were retracted and by means of a thin flat periosteotome used as a lever the dislocation was reduced (Fig. 158). The reduction was not quite complete due



Fig. 158—Case III. Subcutaneous dislocation of the foot. The foot is shown in a position of flexion and adduction.

apparently to the irregularity of the upper surface of the anterior portion of the fractured calcaneum. The attempt to secure perfect reduction was not persisted in on account of the very extensive injury to the soft parts. The subcutaneous tissues were sutured but on account of the great swelling it was impossible to secure accurate apposition of the skin.

The foot was placed in a posterior malleolus splint at right angles to the leg. There was no special necrosis of the skin but the wound healed with but apparent infection. Ten

days after operation a circular plaster case was applied and immobilization maintained for one month longer.

Following the removal of the case baking and massage were instituted and the patient was discharged eight weeks after admission walking with a crutch. His convalescence was slow but his improvement was progressive and within four months he was back at work not at his original job as a furniture mover but in some clerical capacity. He has continued to improve

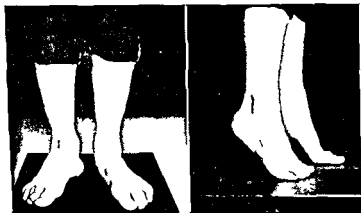


Fig. 159—Case III. Frontal view (left) and lateral view (right) of the feet.

until now I am scarcely able to make out any disability and the patient tells me he thinks his foot is almost as good as it ever was. Figure 159 shows the condition of the foot at the present time.

There are four varieties of subastragaloid dislocation of the foot. That in which the calcaneum and scaphoid are displaced inward; that in which they are displaced outward; and the two much rarer forms in which they are displaced directly forward or backward and downward.



## GUNSHOT WOUND OF FINGER

THIS patient is shown to illustrate the fact that conservative measure should always be attempted in wounds of the fingers before advising amputation.

H O a lad of seventeen was admitted to St Luke's Hospital on March 16 1922. On the day before admission the patient was wounded by the accidental discharge of a .38 caliber revolver which he was handling. The bullet entered on the inner palmar aspect of the proximal phalanx of the third finger



Fig 160—Case IV G h t w d f f g e

of the left hand and traversed the phalanx the wound of exit being on the outer dorsal aspect. He was advised by his local physician to have his finger amputated but he refused this advice and came into the hospital.

The wound of entry was burned and stained by powder. A roentgenogram (Fig 160) showed a comminuted fracture of the proximal phalanx with much displacement. Under ether



anesthesia both wounds were carefully debrided and the fracture reduced after removal of two small loose fragments of bone. No

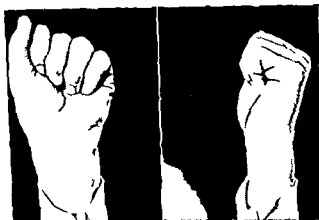


Fig 163—C IV End of the thumb to the back of the hand



Fig 164—Case IV End of the thumb to the side of the finger

attempt being made to suture wounds. Reduction was maintained by elastic traction obtained through a dorsal wooden





Fig 161—Case IV G h t d f f i g e f red ct

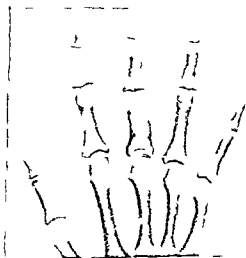


Fig 162—Case IV G h t d f f i g m th f y

anesthesia both wounds were carefully debrided and the fracture reduced after removal of two small loose fragments of bone no

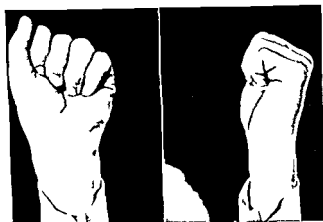


Fig 163—C IV E d lt f t tm t f g h t d f f i g



Fig 164—Case IV E d lt f t tm t f g h t d f f i g

attempt being made to suture wounds Reduction was maintained by elastic traction obtained through a dorsal wooden

splint extending from the wrist where it was fixed with adhesive plaster and projecting beyond the tip of the injured finger. A rubber band was fastened to the end of the splint and attached to lateral adhesive traction straps on the finger.

Figure 161 shows the position of the fragments after reduction. The wounds healed by granulation without apparent infection. Traction was maintained for two weeks and a short palmar splint was worn for one week longer. At the end of three weeks from the date of injury active and passive motion were encouraged and the patient rapidly regained the use of his finger. Figure 162 shows the phalanx nine months after injury. As you see the function of the finger is perfect (Figs 163-164) the only apparent result of the injury being some shortening of the phalanx.

## CLINIC OF DR CHARLES GORDON HEYD

THE NEW YORK POST GRADUATE HOSPITAL

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### HEPATITIS CHOLELITHIASIS HYDROPS OF GALL BLADDER

Hepatitis Associated with or Sequential to Inflammatory Disease of the Abdomen Frequency of Various Types of Hepatitis in Infections of the Right Upper Quadrant Cholecystitis is Usually Only a Part of a More Wide spread Condition Discussion of Hepatitis and Biliary Infection Cholecystectomy Excision of Piece of Liver Tissue Histologic Data on Hepatitis

History—The patient I am presenting this morning is a woman forty even years of age married born in Greece and has resided in the United States during the last eighteen months. She entered the New York Post Graduate Hospital complaining of a lump in the right upper abdomen with constant pain of a dull heavy character for the past three months. The family history of the patient is unimportant and her own personal history is in no way noteworthy except for intermittent attacks of fever of short duration supposedly due to some endemic infection at Malta. The patient has never had typhoid and has by her own statement enjoyed comparatively good health. She is the mother of 8 children all normal deliveries with no obstetric complications. The present illness began three years ago with the sensation of fulness in the upper portion of the abdomen. This fulness or sensation of distention was present more or less constantly and was uniformly made worse by the ingestion of food. After eating particularly greasy food there was a constant desire to belch gas and the patient experienced relief when she was able to eructate gas and always ob

tained complete relief by inducing vomiting. At times the sensation of weight and fulness would be slight or even disappear and at other periods would be much exaggerated the variability in intensity apparently being without any adequate cause. A year ago the patient had an acute attack of pain which came on suddenly about midnight of marked intensity colicky in character and for which she took bicarbonate of soda with no relief and later called a doctor who gave her an injection. On three distinct occasions in the intervening time she has had similar attacks of pain the latest attack three months ago being more severe than those previously experienced. Following the most recent attack her husband noticed that the patient was jaundiced and since then there has been a constant pain in the right upper quadrant of a dull aching character. This pain is not colicky is constant in its intensity and localization and has slowly and continuously become worse. In the beginning it did not distress the patient but in the last ten days has prevented sleep unless anodynes were administered. Shortly after the development of this constant pain the patient noticed a lump to the right of the navel and this mass has become continuously larger from week to week. Until recently the tumor has not been tender and the patient was not particularly impressed with this aspect of her condition until she made the observation that with the enlargement of the tumor her pain became progressively more intense. For the past three months the patient is under the impression that she has lost weight. At no period has she ever noticed that the stools were bright or that her jaundice was more intense than at the present time.

Physical examination reveals a woman with moderate jaundice apparently fifty years of age and presenting the evidence of some loss of weight. There are distinct jaundice of the sclera. The pupils react to light and accommodation and the patella reflex are normal. The examination of the heart and lungs negative. The abdominal examination shows in the right upper quadrant which moves with expiration. The tumor appears to be firm solid yet gives distinct impression of being fluctuant with the distinct palpation of Birt's sign and presents

all the characteristic features of a hydrops of the gall bladder. The chemical blood examination shows urea nitrogen 19.3 mg, uric acid 4.2 mg, creatinin 1.7 mg, sugar 0.12 per cent, leukocytosis 14,000 per cu mm, polymorphonuclears 82 per cent. The Roentgen ray examination by Dr Wm H Meyer shows the kidneys of comparatively normal shape, size, position and illumination. There is no evidence of calculi in either urinary tract. Calcareous deposits noted in the upper abdomen are due to calcification of the costal cartilages. The Roentgen ray examination of the gastro intestinal tract shows a stomach of medium size of the orthotonic type with hypotonic tendency, its axis vertical. The stomach is situated mainly to the left of the median line; this displacement is apparently due to mass pressure in the right upper abdomen, since not only the stomach but the small intestine and hepatic flexure appears displaced somewhat to the left. Otherwise there is no defect in gastric outline. The bulb is of medium large size, somewhat elongated, its summit rising fairly high, sharply knicked and surmounted by a gas bubble. Peristalsis is visualized over both curvatures and is not exaggerated. Evacuation is at first delayed but is later improved, especially by palpation. The bulb on the other hand is slow to empty. There is an infinitesimal speck of residue in the bulb at the end of six hours. There is no evidence of hypersecretion. The motor meal expelled shows a hypomotility; the major quantity is still in the ileum at the end of six hours. The cecum is depressed; the ascending colon, as above noted, is somewhat displaced to the left with evidence of a large oval shaped mass in the right abdomen. Though somewhat contracted above, the shadow of this mass appears to fuse with that of the liver. The fact that the kidney outline on this side has previously been visualized practically excludes a renal tumor. Tentative x ray diagnosis: Hydrops of the gall bladder or a cystic tumor attached to the liver.

**Clinical Diagnosis**—Cholecystitis, hydrop of the gall bladder, cholelithiasis, associated hepatitis.

The diagnosis of this woman's condition is comparatively simple and is based upon three different lines of inquiry, all

important. There is first the history, second the physical examination, third the Roentgen ray examination. I would place their relative importance in the order in which I have presented them. Outstanding and occupying a place entirely distinct and by itself is the history. The chronologic sequence of events in this patient's narrative is succinct and diagnostic. In all its essential characteristics it is the history of gall bladder infection. It is a long story of suffering but without marked disability, without marked impairment of health, and without any great depreciation in her general well being. If we analyze the component elements that enter into the patient's history we find that there are four distinct features in its evolution: the long period of gaseous indigestion, the attacks of severe pain, colicky in character and requiring a hypodermic for its relief, the occurrence of jaundice after the last attack of colic, and finally a constant localized pain with tumor in the right upper quadrant.

Probably the most frequent symptom numerically in abdominal conditions is that of dyspepsia. The stomach by reason of its muscular apparatus and rather close proximity to the outside world by way of the esophagus may be spoken of as the voice of the upper abdomen, and malfunction of the upper intestinal tract induces quite early the symptoms of indigestion. Again dyspepsia is one of the most common reflex disturbances of general constitutional disease. The elaborate statistical work of Cabot classifies indigestion in so far as the etiologic factor is concerned as follows: (1) tuberculosis, (2) cardiac disease, (3) affection of the kidney, (4) neuroses and psychoneuroses, (5) nephritis, while dyspepsia from exhaustion, debilitation, industrial restraint, and alcoholism are so commonplace as to be beyond statistical computation. The classification of causes of dyspepsia from large clinics has shown that of 100 persons complaining of indigestion approximately 40 per cent have the cause of their dyspepsia in organs entirely remote from the abdomen, while 40 per cent have the etiologic factor within the abdomen but remote from the stomach, and less than 20 per cent have actual organic disease of the stomach. The last decade has witnessed the gradual reduction in the incidence of

so called neuroses of the stomach with an extension of the organic cause of stomach disease. As a very commonplace example of indigestion from causes entirely remote from the abdomen one has only to recall that approximately 10 per cent of all cases of locomotor ataxia have been operated upon for a supposed abdominal condition and usually for a supposed ulcer of the stomach, gall bladder condition or a diseased appendix. For practical purposes when we consider ulcer of the stomach, cancer of the stomach, affections of the biliary system and disease of the appendix we will have considered 95 per cent of the surgical affections of the abdomen. We believe that in the systematic evolution of each of these conditions there is as a rule a clear cut and distinct picture and that the history properly interpreted will lead to the correct anatomic diagnosis in at least 90 per cent of the cases.

If one made a study of a sufficiently large number of cases of biliary disease he would find that he could catalog the patients into four distinct clinical groups: (1) those that complain of indigestion only; (2) those that give a history of acute attacks of biliary colic with or without preceding indigestion; (3) those that give a history of biliary colic and also the history of jaundice; (4) those who give any of the above histories and develop the complications of biliary disease—carcinoma, pancreatitis, duodenobiliary fistula, etc.

The early symptoms of cholecystitis, whether calculous or non calculous, are the symptoms of an indigestion of which the chief complaint is gas in the stomach. For a variable period of time these patients complain of a sense of weight and fulness in the stomach, present after small meals and relatively worse after large meals. Upon belching gas there is obtained some relief and a not uncommon history is that of a patient leaving the dinner table and inducing vomiting with complete amelioration of symptoms. The gas production is in a measure dependent upon the quality of the food—carbohydrates, fats, starches, nuts and some fruits induce a greater degree of gas production. These patients are treated for nervous indigestion or gastritis when they have a chronically diseased gall bladder with thickened



wall and a loss of the normal distensibility of the gall bladder. Into this history there may ensue at a later period or without this history of indigestion the first indication of biliary trouble may be ushered in by an attack of acute sharp agonizing pain which comes on like a stroke of lightning is of maximum intensity and is associated with restlessness and movement upon the part of the patient. There is a strong desire to lean over a chair or to grip the lower part of the thorax. With this is usually associated nausea and vomiting. The attacks of pain have a predilection for nocturnal occurrence and are so severe as to require hypodermics of morphin for their control. The characteristic and outstanding feature is the lightning like onset of the pain without premonition or warning and its intensity requires morphin. After four to eight hours the pain disappears almost as rapidly as its onset leaving behind a residual soreness along the right costal margin. The third clinical group is characterized by a history somewhat after the fashion of the preceding types with the exception that after an attack like the above the patient is jaundiced and in this group we have a triad of symptoms—*colic jaundice and fever*. This jaundice is associated with colic and usually with chills, fever and sweating and for many years masqueraded under the title of Charcot's intermittent hepatic fever and was variously ascribed to malaria.

Jaundice is a symptom of sufficient magnitude to make a patient apprehensive. If one considers the diagnostic possibilities of jaundice he will find that aside from catarrhal jaundice—a condition founded upon insecure pathological information—which is characterized by slight constitutional disturbance and uniformly resolves and clears up in four to six weeks we have essentially a differentiation of jaundice produced by neoplasms and the jaundice produced by calculous disease of the biliary apparatus. Stupor is only associated with jaundice in cirrhosis and acute yellow atrophy while emaciation uniformly present in all types of chronic jaundice irrespective as to the etiologic factor. The onset of jaundice with colic predicates an infective process and since 98 per cent of all gall stones have had their origin in infective changes in the gall bladder we find that the

gall bladder in chronic calculous cholangitis is atrophied thickened or undergoing fibroid contracture and is non palpable on physical examination unless there is an accidental occlusion of the cystic duct with hydrop of the gall bladder

The history of this patient has revealed a chronic gaseous indigestion with attacks of colicky pain and jaundice—a trinity of symptoms which renders a diagnosis of biliary disease almost positive. On physical examination we find a mass in the right upper quadrant cystic in character which we interpret as a hydrops of the gall bladder. This opinion as to the essential nature of the tumor is strongly confirmed by the Roentgen ray examination. If we look at our available diagnostic data from another angle we have in this case an exception to the so called Courvoisier law which states that in cases of chronic jaundice due to blockin of the common duct a contracted and atrophic gall bladder signifies that the obstruction is due to stone a dilatation or distention of the gall bladder that the obstruction is due to causes other than stone. The exceptions to Courvoisier's law are few. Sciatum they may be noted as follows (1) Stone in the cystic duct with hydrop or empyema of the gall bladder and associated with adjacent infection of the common duct. Our case represents a classical example of this type of mechanical occlusion of the cystic duct with hydrops (2) acute cholecystitis with obstruction of the cystic duct and stone in the common duct (3) chronic pancreatitis with stone in the common duct (4) a stone in the cystic duct with compression of the common hepatic duct (5) malignant disease along the course of the common duct with an old chronic fibroid cholecystitis. It is evident that we have a cholecystitis with hydrops probably due to calculous obstruction of the cystic duct and inferentially an associated hepatitis. The presence of hydrops in this particular patient is incidental or accidental representing an occluded cystic duct and is in no way essential to the diagnosis of gall bladder disease and serves only to explain the constant character of her pain in the last three months and to provide an exception to Courvoisier's law.

*Discussion* —In attempting to interpret disturbed physiology in disease of the external biliary apparatus we must recognize that the liver and its ducts are but one part of the alimentary system and physiologically conform to the fundamental neuromuscular mechanism that applies to the entire alimentary system. The underlying basis of the physiologic action of the gut tube is embraced in the so called law of the intestine a name given to it by Bayliss and Starlin sometimes called the law of contrary innervation of Meltzer. In simple language this law means that local stimulation of any segment of the intestinal tube causes a contraction above and a relaxation below the stimulated part. There is always a contracting impulse at the cephalic end and an inhibitory impulse at the caudal end. As a corollary to the principle of rhythmicity of gastrointestinal movement it has been demonstrated that whenever there is an irritation of the gut tube that portion of the alimentary tract above the point of irritation participates in the beginning in an exaggeration of its normal function. Meltzer asserted that the law of contrary innervation is manifested in all functions of the animal body and a disturbance of this law is a factor more or less important in the pathogenesis of many disorders and diseases of the animal body.

When we survey the gastrointestinal tract we are impressed with the fact that in the scheme of nature there are normal points of stasis. In the gall bladder we have a point of natural or physiologic stasis and we might well question if it is not possible for a physiologic state of stasis to become lengthened out into a condition with distinct pathogenesis. In other words we may pass from a physiologic stasis into a pathologic stasis. In the upright position the fundus of the gall bladder is at a lower level than the outlet. The morphologic arrangement is true of all viscera that contain fluid and presuppose the ability of the organ to exercise contractile force and expel at least some portion of its contents. The gall bladder however is incapable of completely emptying itself and although its striated muscle

Thenceforth the process of emptying itself is continued.

fibers are contained in its wall they are without any definite arrangement into a distinct muscle layer and are too sparsely distributed to make a complete evacuating organ. In spite of the paucity of muscle fibers the gall bladder undergoes spontaneous rhythmic contractions from eight to ten times a minute. The lymphatic supply to the external biliary system is extremely rich and there is no anatomic partition or barrier between the intra-hepatic and extrahepatic lymphatic distribution. The bile within the gall bladder is materially different from the bile secreted from the liver or from the bile contained within the ducts. The former is concentrated, darker in color, has a higher specific gravity and is chemically changed by the addition of mucin and nucleo albumin. Rous and McMaster recently demonstrated that the passage of bile through the cystic duct concentrated the bile from two to four times while the gall bladder is capable of concentrating the bile ten times in twenty-four hours.

The secretion of bile is continuous yet it is delivered into the duodenum intermittently. In other words we have a continuous secretion with periodic delivery. Correlated with this is the fact that the secretory pressure of the bile as it descends from the liver through the common duct is by and of itself insufficient to overcome the sphincter of Oddi even with the addition of the contractile pressure of the gall bladder there is not sufficient pressure to overcome the normal tonicity of the sphincter. There is required for physiologic relaxation of the sphincter an inhibitory impulse to allow the ejection of bile into the duodenum. From a neurovascular point of view the muscle fiber of the gall bladder and the sphincter of Oddi at the ampulla of Vater are antagonists in their action and in a normal physiologic biliary system the contraction of the former implies relaxation of the latter. During the fasting state the duodenum is free from bile and it has been demonstrated that the introduction of acid chyme, peptones, albumin or the irritation of the duodenal mucosa by a thread or a duodenal tube is sufficient to inhibit the sphincter of Oddi and bring about the delivery of bile. The fact that nature planned an intermittent

delivery of bile into the duodenum must have a reason. It must be conceded that in the absence of gastric contents bile should not be present in the duodenum. This is a functional advantage to the individual and represents a protective mechanism in order to have the duodenum empty of bile when there is no physiologic demand for it. Morphologically the bile is delivered just at the partition between acid and alkaline digestion at the point of transformation of chemical activity from an acid to an alkaline medium. The evacuation of gastric material in small amounts and at frequent intervals corresponding to the relaxation of the sphincter of Oddi clearly predicates that the bile will be delivered into the duodenum in response to the normal physiologic demand.

The bile is not purely an excretion for the bile salts are reabsorbed and undergo a more or less continuous circulation. One has only to recall the very marked improvement that takes place in patients who are losing bile through common duct drainage when they are fed their own bile. So impressed are we that in all cases of common duct drainage we feed the patients their own bile. Cokeman demonstrated that soon after a biliary fistula has been established the salts in the bile fall to one tenth of the normal since reabsorption cannot occur. This suggests that normally bile salts are excreted and reabsorbed ten times before being destroyed or eliminated. Bile is therefore delivered into the duodenum as the summation of three factors: the hepatic secretory pressure, the expulsive force of the gall bladder plus the ascent and descent of the diaphragm during respiration providing a milking action. The maximum pressure exerted by the three is insufficient to overcome the tonicity of the sphincter unless another factor is brought into play, namely, the relaxation of the sphincter of Oddi.

At one time gall stones were considered the only pathologic evidence of a diseased gall bladder and the finding of stones as interpreted as the essential pathologic lesion. We know that this is incorrect and that it is the infective process in the gall bladder or the biliary system that induces the pathologic change and provides the surgical indication. It is the deeper tissues of

the gall bladder that are more particularly involved and 20 per cent of the lesions of the gall bladder that require surgical intervention are characterized by the absence of gall stones

There are four theoretic ways in which the gall bladder may be infected Of these one presupposes a mucosal infection the infecting organism reaching the gall bladder either by ascent from the duodenum or descent from the liver Laboratory experiments demonstrate that it is with the utmost difficulty that the gall bladder can be infected from within its cavity The

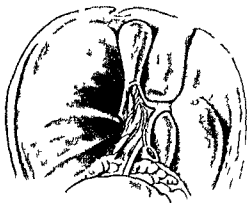


Fig 165—The lymphatics of the gall bladder and its ducts (F. K.)

injection of virulent streptococci into the interior of the gall bladder does not produce gall stones Other pathologic factors must be brought into play which lessen the resistance of the tissue beneath the mucosa Coffey has demonstrated that the duodenum will rupture under pressure before there is a reflux of material up the common duct It does not seem probable that cholecystitis commonly arises from infection by way of the mucosa Two other possibilities for infection of the gall bladder are the bringing of infectious material through the blood stream

or by contact from contiguous viscera. If the blood stream is the means of infection we must distinguish a straight hematogenous infection and an infection by means of the portal system. Rosenow in a series of very beautiful experiments demonstrated the possible source of cholecystitis from infectious emboli in the walls of the gall bladder and drew attention to the relative affinity of certain types of bacteria for the tissues of the biliary apparatus. That this is a method of infection in certain

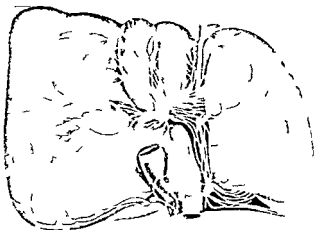


Fig 166—Anastomosis between the lymphatic trunk of the gall bladder (left) and the common duct of the gall bladder (right). Anastomosis between lymphatic of gall bladder and partly of the right of the gall bladder (Sappey)

cases cannot be denied but it must be relatively infrequent by reason of the comparative rarity of embolic processes of the gall bladder in any of the accepted forms of bacteremia. If the vascular system either systemic or portal were at fault one would expect that the liver as well as the gall bladder would show uniform changes throughout its substance but this is not true for we find that in infections of the gall bladder that it is the right lobe of the liver that is preponderantly involved and particularly that portion in intimate contact with the gall bladder.

The fourth method for infecting the gall bladder would be by means of the lymphatic circulation and it has been demonstrated by Franke (Fig 165) Sweet Deaver and Pfeiffer that there is a very intimate and extensive lymphatic connection between the gall bladder liver common duct and pancreas. Anatomically according to Sappey Sudler and Graham there is no separation between the extra and intrahepatic system of lymphatics (Figs 166 167) and a hepatolymphatic infection



Fig 16 —F c mm t bet lymph t f l d g ll bladde  
(S dl )

would offer a reasonable basis to account for most of the cases of cholecystitis

It seems logical to believe that in the majority of cases cholecystitis represents a direct infection of the wall of the gall bladder from an infected liver. Infection reaches the liver by the portal vein involves the periportal tissues and induces a pericholangitis with involvement of the intra and extrahepatic lymphatics thereby bringing by direct extension an infection



of the walls of the gall bladder. This would offer an explanation for the cholecystitis that is coincident with appendicitis, peptic ulcer, typhoid fever, and suppurative hemorrhoids.

It has been our experience that the diseased gall bladder without stones is distinctly a greater menace to complete recovery and future well being than is the less grossly changed gall bladder with stones. The palpatory diagnosis of disease of the gall bladder in cases not characterized by the presence of stones is fallacious, and an opinion as to the normality of a gall bladder simply upon palpation through a lower abdominal wound is seriously open to question. There are however certain criteria which in the absence of calculi may collectively be taken to indicate that a particular gall bladder is pathologic. *Sciatum* these may be defined as follows: (1) A loss of the normal color—under normal conditions the gall bladder is never white, brown, or mottled, but always possesses its distinctly olivary green tinge. It is essential that the color of the gall bladder be noted upon opening the abdomen, for upon exposure to the air it takes on a rather blanched appearance. (2) The walls of the normal gall bladder are quite thin and any marked increase in the mural thickness bespeaks infection. (3) The deposition of saffron-colored fat well up to and on the fundus of the gall bladder is distinctly abnormal and represents infiltration of the wall. (4) The presence of varying degrees of pericholecystitis is suggestive only. Personally we are unable to account for some of the many adhesions that exist between the duodenum and gall bladder including the so-called cysticoduodenal and cysticocolonic adhesions which Todd states are present in 1 out of 4 individuals. We have found adhesions in apparently normal persons, so frequently without any disabling anastomosis, and so far as we can determine in patients free from upper abdominal symptoms that the finding of occasional adhesions between the gall bladder and colon in the absence of symptoms must be accepted as of minor value in determining the degree of pathology in the gall bladder. (5) The inability to express bile from the gall bladder by manual compression is of very little diagnostic importance and is not necessarily indicative of pathologic change. By the

peculiar S shaped conformation of the cystic duct and ampulla the gall bladder can be distended almost to the point of rupture without allowing any bile to flow through the cystic duct. Adhesions angulating the cystic duct can bring about the same condition without intrinsic disease of the gall bladder being evident. (6) The presence of hyperplastic lymph glands along the course of the cystic and common ducts is indubitable evidence of infection of the biliary system for the mechanism of lymph adenitis is the same in the biliary system as it is elsewhere in the body and adenitic hyperplasia represents infective irritability. (7) The finding of a papillomatous mucous membrane rather than the normal smooth type with minute cholesterol crystals embedded in its substance is of primary importance in the diagnosis of the so called strawberry gall bladder. We place little value in the so called inspissated bile as an evidence of infection primarily because it is the normal condition for bile to be inspissated or concentrated within the gall bladder. (8) The presence of white plaques extending from the serosal covering of the gall bladder to the under surface of the liver. They represent to our mind fibrosis in the liver tissue concomitant or sequential to gall bladder infection. An infected gall bladder with or without stones we believe is an expression of a pathological change more wide spread and extensive than that which is represented in the gall bladder itself. One has only to recall the clinical association of hepatitis with appendicitis, ulcer of the gastroduodenal segment, pancreatitis and gall bladder to infer that there is a definite pathological association between any or all of these affections. The association of glycosuria with primary disease of the gall bladder and its subsequent cure after operative relief of cholecystitis has been made frequently enough to show that there is more than an incidental or casual relationship. We have recognized for a number of years a cholecystic toxemia which manifests itself by changes in organs quite remote from the liver. During this period of time we have also been impressed with the macroscopic picture of the liver in patients operated upon for chronic disease of the biliary tract. There is as a well founded idea that many of these cases show definite liver changes.

either subsequent to infection of the gall bladder or coincident with gall bladder infection. From time to time in checking up our after results we have been impressed with the clinical fact that the patients who showed gross demonstrable changes in the liver at operation either in the form of fibrous trabecular enlargement of the right lobe of the liver, scar formation over the surface of the liver or changes in color were those least benefited by the gall bladder surgery. We are convinced that there is a type of liver disease that is concomitant of long standing gall bladder infection that leaves the patient a more or less invalid irrespective as to the type and kind of surgery employed.

Our pathologic interest in hepatitis was stimulated by two very splendid contributions, one by E. A. Graham entitled *Hepatitis An Accompaniment of Cholecystitis* appearing in *Surgery Gynecology and Obstetrics* May 1918 and the second one by Peterman, Priest and Graham entitled *The Association of Hepatitis with Experimental Cholecystitis and its Bearing on the Pathogenesis of Cholecystitis in the Human* appearing in the *Archives of Surgery* January 1921. Graham demonstrated by the removal of a piece of liver from cases that came to operation for cholecystitis that they exhibited the microscopic evidence of hepatitis and that this inflammation appeared to be in the nature of a pericholangitis. It is interesting to note that when hepatitis occurred presumably secondary to cholecystitis the right lobe of the liver was much more frequently affected than was the left and such changes as did occur in the right lobe of the liver were always more predominantly marked in the area of the gall bladder (F. 168).

*Adam* has demonstrated that under normal conditions colon bacilli may be present in the blood stream and eliminated from the liver in apparently normal bile so that the mere presence of bacteria in the bile stream may or may not influence us in our conception of primary liver change. The liver may be infected presumably in four ways: (1) Hematogenous infection (2) By means of the portal system (3) Through the lymphatics (4) From contact with continuous pathologic ganglia.

Infection of the liver by means of the arterial blood stream

is a well known method and concerns itself with embolic processes and in septicemic states. Acute infection of the liver through the portal system has its clinical pathology demonstrated in septic pylephlebitis following appendicitis. These are es

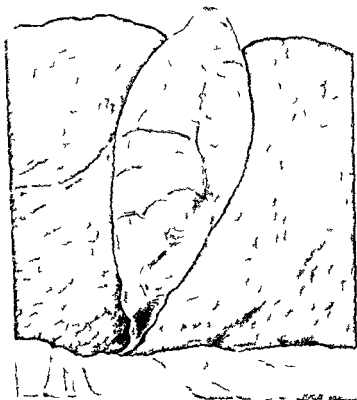


Fig 168—Act 1 d g m d t o p e t h g hyd ps n  
t il dg damp l g of l r i ce with ea i fib t pl m t  
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sentrially acute processes and do not interest us at this time. Chronic li er changes by means of the portal system is expressed in its most typical form in portal cirrhosis.

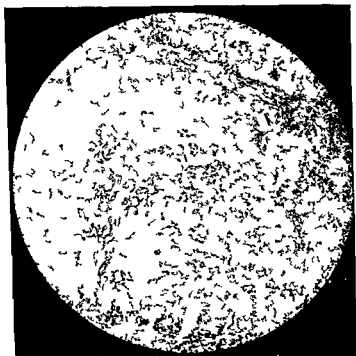
In the type of hepatitis with which we are concerned there

is a pericholangitis of the minute bile radicles and this condition is found in association with inflammatory conditions in the abdomen. An infection of the liver from the gall bladder or an infection of the gall bladder from the liver must occur in one of two ways—either through the lymphatics or through the veins. If the liver is infected from a primarily diseased gall bladder by way of the veins the microscopic evidence of that liver involvement should correspond to the equitable distribution of the veins throughout the liver. This does not occur but changes in the liver are greatest in the region of the gall bladder and diminish inversely with the distance from the gall bladder. If the liver is primarily involved and gall bladder secondarily it is reasonable to presume that the infection of the gall bladder takes place by means of the lymphatics.

A consideration of the anatomy and morphology of the liver is of value in anticipating the mechanism of hepatic degeneration. The liver, the largest gland in the body, is concerned with the most diverse of metabolic functions. In the metabolism of fats, carbohydrates, and sugars it occupies a place in body chemistry all its own. In its ability to detoxify chemical and biochemical irritants it is one of the chief safeguards in preventing inundation of the system with incompletely destroyed toxic by-products. As the manufactory of bile viewed either as an excretion or secretion it occupies a separate physiologic field and in turn the liver is intimately associated with the digestive chemistry of pancreatic digestion and intestinal assimilation. The liver stands midway as a buffer state between general and portal circulation and is an efficient filter between the by-products of plenic circulation and the general circulation. It derives its arterial blood from the hepatic artery, but two-thirds of this arterial blood is diverted to the cystic, gastric, and pancreaticoduodenal arteries; so the actual amount of oxygenated blood going to the liver is comparatively small.

One has only to compare the arterial blood of the liver with the arterial blood sent to the spleen or kidney, the latter two organs performing their functions in the presence of an adequate or ample oxygenated blood. The liver, on the contrary, per-

forms all of its functions upon blood that is essentially non oxygenated as the liver cells receive blood only from derivatives of the portal vein the hepatic artery supplying the walls of the blood vessels the bile ducts and the liver capsule. The liver reacts to long continued or habitual toxic irritation by two pathologic processes—one the degeneration of liver cells and



Fg 169—Early stage of biliary hydrops. The marked thickening of the trabeculae of Glisson's capsule with increased thickness of the blood vessel A P t i b h B b i d t

the other the proliferation of connective tissue. These processes apparently go on simultaneously and as to which is primary and which is secondary is of academic interest only. Certain it is that degenerating areas are replaced by connective tissue and intracellular material and that by replacement or contraction there is atrophy of liver parenchyma.

By a consideration of the histologic architecture of the liver lobule pathologic changes may be rendered comparatively simple. By means of an essentially similar cell contact on one side with portal blood and on the other with bile radicles we have a dual mechanism for irritation of the hepatic cells. If the portal

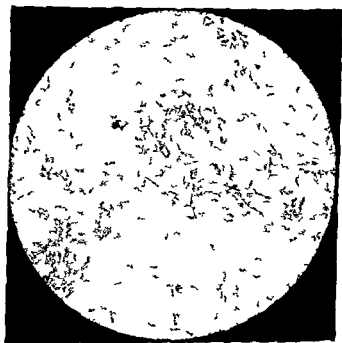


Fig. 170—Ch. t. t. l. h. p. t. t. d. mod. t. ly. ly. tag. f. biliary l. Th. fib. h. k. g. f. th. t. be. l. a. m. m. a. k. d. tha. Fig. 169 d. th. d. c. ll. fil. t. lat. vel. l. ss. h. b. t. ga. some what m. ea. ly. lat. d. t. th. bu. d. ct. th. t. th. port. l. b. h. A. P. tal. b. hes. B. bl. d. t.

radicles bring the offending agent to the liver cells. We have changes in the way of a round cell infiltration and replacement fibrosis taking place about the veins and giving varying degrees of portal cirrhosis. If the irritating agent is contacting with the liver cells through the biliary system the same mechanism

takes place with round cell infiltration and fibrous replacement and we have the histologic picture of a biliary cirrhosis (Figs 169-170)

By means of the high reparative power exercised by the hepatic cells the liver is capable of withstanding long continued injury with but slight impairment of function and the clinical condition of an individual as the result of continuous hepatic injury will depend upon the degree of involvement of the liver cells and the corresponding replacement by fibrosis. If the agent is acute and highly toxic the changes are rapid and in the nature of a fatty degeneration. If the irritating agent is more attenuated the pathologic picture is that of a round cell invasion and infiltration with the development of fibrous tissue replacement. The patient for a long period of time may show no symptoms of hepatic insufficiency by reason of the compensatory action exerted by the liver. The final clinical outcome of hepatic exhaustion or marked hepatic insufficiency is stupor and coma which are the inevitable terminal picture in acute yellow atrophy and in cirrhosis.

If we begin with a very benign liver change it is possible to pass gradually into more marked conditions of liver degeneration until the final outcome in acute cases is similar to acute yellow atrophy and in chronic cases to portal cirrhosis. We believe that when an infection is once initiated within the abdomen and its course is chronic the liver reacts in a variety of ways but always with some degree of hepatic degeneration and that in a certain proportion of cases surgical intervention in these cases is associated with or followed by death due primarily to hepatic insufficiency. This insufficiency is the result of two factors—one a chronic deficiency of liver function as the result of long continued infection and the second the sudden addition of an operative toxemia from the surgical intervention with trauma, etherization and postoperative acidosis.

I wish to draw your attention to three clinical states that occasionally attend after operations on the biliary tract. The immediate postoperative deaths in biliary surgery are due in a large measure to mechanical or anatomic factors such as hemor-



rhage shock gastric dilatation and exhaustion. Seldom does the element of wide spread infection or peritonitis become a lethal factor. We have observed complications after operation on the gall-ducts in which the mechanical causes of death could be eliminated and in which there was no evidence of infection and in which cholemia or too rapid loss of bile would not explain the condition.

The most frequent of the three types of clinical pictures that we have observed after operations on the biliary tract is a condition of profound vasomotor depression. The patient ordinarily has been behaving quite as usual following an operation for cholecystectomy or drainage of the common duct. At the end of twenty four to thirty six hours without any apparent reason the patient passes into a pronounced state of vasomotor collapse with cold clammy extremities wet moist and leaking skin a very much stimulated mentality and a facial expression not unlike the facies of fear. The condition is not associated with dilatation of the stomach and there has been ample evidence of kidney function. The intravenous administration of a 10 per cent solution of glucose (1000 c c) every four to six hours and continuous Murphy p octoclysis with tap water has usually brought about a recovery. It is interesting to note that when this type of complication occurs it has usually been in cases that have had a previous operation upon the gall bladder and at the second operation have had drainage of the common duct with palpatory or manual manipulation of the pancreas. For want of a better explanation we have interpreted this type of picture as due to some pancreatic toxin or ferment liberated by the surgical trauma with inadequate liver protection.

A second type of clinical picture occurs after a varying period of time usually the fifth day in patients who have had comparatively simple gall bladder operation but who have been chronically jaundiced. A normal convalescence has been progressing up to the time of the onset of a slight degree of somnolence. They may or may not have lost large quantities of bile through external drainage. They slowly become stuporous and in the course of twelve to twenty four hours pass into com

The temperature rises to 103 or 104 F kidney function has been adequate previous to this There is no evidence of infection within the abdomen and the condition is not one of dehydration following too rapid loss of bile through the drainage tube Nor has there been any increase in the obstructive cholangitis if this were present previous to the operation We have here a condition not unlike the coma of cholemia in a patient who is adequately drained and who had no further increase of obstructive jaundice We have fed these patients their own bile either by allowing them to drink it or by giving it by stomach tube and have not prevented the fatal outcome by these procedures This condition is essentially a coma occurring in a patient with a diminished obstructive jaundice Are we dealing with a frank case of liver exhaustion similar to the terminal stages of a portal cirrhosis?

Less frequently we have observed a third type of clinical picture that supervene immediately after operations on the gall bladder This type is infrequent and it is interesting to note that it has occurred after rather simple types of operation on the biliary apparatus This lethal complication has terminated however a long history of gall bladder or biliary duct infection These patients as a rule have not been jaundiced The clinical onset is characterized by the onset of coma almost immediately following operation The patient ordinarily does not recover from the anesthesia a fact that should be noted The temperature rises to 104 or 105 F with marked acceleration of pulse usually subultus tendinum carphology and talking delirium and more rarely marked motor excitation Chemical tests of the blood before operation demonstrated that kidney function was adequate and within normal limits Spinal puncture after the onset of coma has revealed an increase in fluid under pressure cell count of 10 to 15 per cubic millimeter with 2+ globulin reaction and negative Wassermann examination

Dr John A Killian Assistant Professor of Biochemistry of the Department of Biochemistry New York Post Graduate Medical School and Hospital has undertaken the study of this condition and we have been fortunate in being able to study

the last 6 cases from a chemical point of view. Of outstanding interest has been the observation that these patients show a carbon dioxide combining power markedly increased above the normal representing 81 to 100 volumes per cent. This has not been due to the previous administration of alkalies and the condition has been designated chemically as an alkalosis (Fig 171). So far as its fatal outcome is concerned it is much more pernicious than an acidosis. Of the 6 cases recently studied 4 terminated fatally and all of these were instances of chronic disease of the gall bladder with simple operations.

There exists in the blood plasma a buffer system comprising acid and basic compounds. Under normal conditions the acid compounds are carbonic acid and acid phosphates while the basic compounds are bicarbonates and alkaline phosphates.

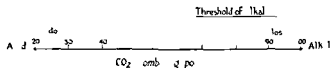


Fig 171—A      se    th    ca    bo    d    vid    mb    g    po    t    d    80  
duca    lkal    th    se    d

The normal blood plasma shows a slight excess of the alkalies over the acids this excess constituting the alkali reserve of the plasma. The range of the hydrogen ion concentration in the normal plasma is then slightly to the alkaline side ( $\text{pH} = 7.4 - 7.6$ ). It is well known that an accumulation of abnormal acid bodies, i.e. acetone bodies in diabetes or an increased concentration of acid bodies normally present (i.e. acid phosphates in nephritis) leads to a decrease of this alkali reserve producing an acidosis. The most practical method of determining the extent of this alkali reserve is by measuring the amount of carbon dioxide that will combine with a definite amount (100 cc) of blood plasma. The normal plasma should take up 55 to 60 volumes per cent of the carbon dioxide. A decreased carbon dioxide combining power indicates a low alkali reserve, i.e. an acidosis. A decrease in this combining power to 40 indicates

a moderate acidosis to 30 a severe acidosis and to 20 an acidosis which will probably prove fatal. Cases of acidosis are comparatively frequent and the methods of relieving it are well known.

With the more general use of Van Slyke's method for the study of the alkali reserve of the blood there has recently been noted a few cases in which the carbon dioxide combining power has been markedly increased above the normal from 81 to 100 volumes per cent. A carbon dioxide combining power over 80 volumes per cent would indicate the clinical and chemical condition of alkalosis. Whether this increased carbon dioxide combining power is associated with a decreased hydrogen ion concentration has not been determined. The toxicity may be due to an accumulation of basic ions alone without an associated change in hydrogen concentration. These points are at present under investigation.

With the co-operation of Dr. Ward J. MacNeal, Professor of Pathology, New York Post Graduate Medical School and Hospital, we are combining this chemical investigation of Dr. Kilham with a minute histologic examination of portions of excised liver from both the right and left lobe of the liver in the attempt to obtain if possible a parallelism between the degree of pathologic changes in the liver and the disturbed chemistry exhibited in what we may call temporarily at least alkalosis.

Whether the liver is primarily at fault in the three clinical conditions that I have outlined we do not know. It does seem reasonable however to assume that they are in some way associated with liver dysfunction. In their terminal manifestations they simulate in many ways the clinical conditions that are observed in diseases of the liver where there is a manifest loss of liver function. It is interesting to speculate as to whether there are not conditions of liver insufficiency which give a variety of minor symptoms or that may exist without any symptoms for a long period of time by reason of the marked regenerative property of liver tissue. From the viewpoint of surgical prognosis may we not claim that these unrecognized cases of hepatitis are the cause of some of our unexplained mortalities and that

contribute much to the morbidity that sometimes follows apparently the most successful type of surgical intervention on the biliary system. Of the pathologic evidence as to the instance of hepatitis we have ample data. This data comprises microscopic and macroscopic changes. The work of Dr. Kilian suggests the possibility of linking up disturbed liver function with measurable coefficients of carbon dioxide combining power. It is reasonable to suppose that inflammatory disease of the abdomen throws an injury upon the liver that if not interrupted by spontaneous cure or surgical intervention will produce the indubitable changes which we can recognize pathologically at least as chronic hepatitis.

**Operation**—For a number of years we have been making a standard type of incision in this clinic for exposure of the contents of the right upper quadrant and for operative approach to the gall bladder, common duct and duodenum. The incision begins midway between the ensiform cartilage and the right costal margin, extends downward and slightly outward to the right, terminating 1 inch to the right of the navel. This incision allows us to increase our operative field either upward or downward and with a Balfour retractor inserted in the upper angle gives us adequate and ample room for operative manipulation. The course of the incision is roughly parallel to the line followed by the common duct. We have seldom used the transverse incision and rarely the hockey stick or the S incision and it is over ten years since we used the oblique incision in operations on the right upper quadrant. The edges of the wound are protected by laparotomy pads for two purposes: first to prevent undue or unusual traumatism of the already infected non-essential fat and second to prevent soiling in our manipulation of the infected viscera. In all cases when the peritoneal cavity is free from infection we carry out systematic exploration of the abdominal contents in the following order: (1) The examination of the stomach and gastrooduodenal segment; (2) the lifting of the transverse colon upward and to the left and inspection of the duodenojejunal angle at the base of the mesocolon; (3) the palpation of the spleen; (4) palpation of the small intestine and

pelvis (5) palpation of both kidneys (6) elevation of the cecum and exposure of the appendix. Of course if the peritoneal cavity is soiled or infected this exploration is omitted. These exploratory maneuvers require very little time are without danger and permit us to obtain a comprehensive knowledge of the remainder of the abdomen. It is important to carry out a systematic exploration of the abdomen for some 20 per cent of patients operated upon have two conditions at one and the same time either one of which reasonably demands surgical treatment. The number of instances of fibromyoma associated with disease of the gall bladder of tubal and adnexal disease with affections of the right upper quadrant of appendicitis and gastroduodenal ulceration of salpingitis and appendicitis are sufficiently numerous to warrant an operative record of all the pathologic conditions that can be determined by palpation in the opened abdomen.

We make it an almost invariable rule to remove the appendix when operating for affections of the right upper quadrant. It is not a mere incidental relationship which is revealed between ulceration of the gastroduodenal segment and appendicitis and between cholecystitis and disease of the appendix. It is a causal relationship for there is microscopic evidence of chronic inflammatory disease of the appendix in over 60 per cent of the cases with ulcer of the stomach and duodenum. In 58 per cent of the cases requiring cholecystectomy there is a chronic appendicitis. Contrast this with 16 per cent which is the normal postmortem incidence of disease of the appendix and we readily see the close interrelationship between pathologic changes in the appendix and disease of the right upper quadrant.

We have made our incision and the edges of our wound are adequately protected. We see the omentum crowding into the wound and overlying but not adherent to an enlarged glistening white gall bladder. The liver shows a very marked Riedel's lobe the right edge of this lobe extends downward almost to the level of the crest of the ileum. I should judge that the entire liver is probably about 35 per cent larger than normal. You will notice that most of this enlargement is in the right lobe of the liver. Riedel as long ago as 1881 thought that the lingu

form process of the right lobe of the liver which now bears his name was due to disease of the gall bladder such as inflammation calculi or traction from adhesions

It is interesting to recall that Silvestri and others attempted to create liver function in regard to the right and left lobe of

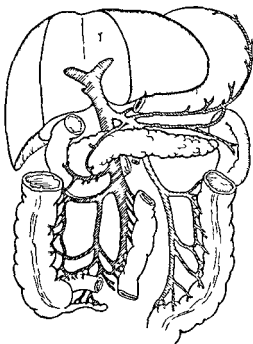


Fig 172—Diagrammatic representation of the segments of the portal blood in the gall bladder and the right and left lobes. The right lobe is shown in relation to the pylorus, gall bladder, and small intestine. The left lobe is shown in relation to the stomach and spleen.

the liver. It has been a frequent observation that when the liver is enlarged in diabetes the right lobe is affected while in Bant's disease and other pleromegalia it has been observed that the left lobe participates more particularly. The work of Glenard and Seegen lends emphasis to this contention for in their experiments the left lobe of the liver is intimately co-

nected with the stomach and spleen while the right exhibited more definite relationships with the pancreas and small intestine. The injection of staining fluids into the spleen invariably produced discoloration of the liver limited to the left lobe while injections into the superior mesenteric veins as a rule stained the right lobe of the liver more than the left (Fig. 172).

You will notice extending back from the gall bladder there are lines of white fibrous tissue that there is dimpling of the surface of the liver evidently due to fibrous contraction of the trabeculae of the capsule of Glisson. At various points along the edge of the liver there is marked indentation most prominent in the region of the gall bladder and again about 5 cm. external to it. You will observe the dimpling and crenation of the under surface of the liver; you can readily see the white fibrous areas on either side of the gall bladder (see Fig. 168). The gall bladder is quite large measuring approximately 15 by 7 cm. It is entirely without any green or olivary green color. Its wall is more or less thickened and contains white bile. In obstructive conditions at the ampulla of Vater it is usual to find the gall bladder distended with bile. This is not necessarily always the case as a distinct hydrops with clear mucoid material may be present with patulous hepatic and common ducts. The presence of so-called "white bile"—a colorless liquid without bile pigment—in obstructive conditions of the common duct is uniformly associated with an increased surgical risk approximating 20 per cent. This mortality has not been influenced to any marked extent by more diligent preoperative or postoperative treatment even including blood transfusions before and after operation. Kausch thinks that the hydrops in these cases is due to excessive secretion by the mucosa of the gall bladder and ducts whereby the duodenal opening being occluded the pressure in the biliary system being so raised that the bile secreted by the liver cells is poured not into the excretory ducts but back into the blood and lymph vessel of the liver.<sup>1</sup> Occasionally there is a distinct hydrops and a well dilated common duct filled with clear mucoid

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fluid has been observed and when this rather uncommon condition is seen it is associated with patulous cystic and hepatic ducts and mechanically represents a pressure acholia. Rous and McMaster have shown experimentally that white bile occurs only when the obstructed ducts are not connected with a normally functioning gall bladder and conclude that this fluid is a secretion of the mucosa of the biliary passages which occurs with obstruction when the secretion of the mucosa of these passages is greater than its absorption.

I can palpate a number of stones most of them 1 or 2 cm in diameter. By grasping the right lobe of the liver and making traction gently upward and to the right we can dislocate the liver so that the major portion of the right lobe of the liver rests almost entirely outside of the abdomen. This brings the gall bladder and cystic duct under tension. We will now proceed to perform a typical cholecystectomy from below up. First however we will introduce the first and second fingers of the left hand into the foramen of Winslow and determine the presence or absence of pathologic change in the common duct. This patient is jaundiced and we must determine whether her jaundice is due to intrinsic calculous occlusion of the common duct or due to adjacent or mural inflammation. I find no evidence of calculi in the common duct. The pancreas feels somewhat corrugated but not definitely pathologic. One must remember however that the palpatory diagnosis of pancreatitis is open to serious question as we may have a pancreas with a feel of hardness and yet have a normal secretory activity both from the point of view of its external secretion into the intestinal tract or in regard to its internal or insular secretion.

We will now proceed with our cholecystectomy. This gall bladder so far as function is concerned is useless and hopelessly beyond any possible restitution to normal. In removing the gall bladder there are certain well-defined dangers that one must be familiar with in order to safeguard the patient from possible injury to the hepatic and common ducts. There are numerous reported instances in the literature where the common hepatic duct or common duct has been divided

injured in performing an apparently simple cholecystectomy. You will notice that the lowest portion of the gall bladder the so called Hartmann's pouch hangs down over the cystic duct and is enclosed in a common peritoneal fold with the cystic duct. We will grasp Hartmann's pouch with an artery clamp and make traction upward and to the right. With a curved Mayo scissors we incise the peritoneum over Hartmann's pouch. You will notice that with this dissection Hartmann's pouch swings upward exposing the cystic duct. You will recall that there is a triangle

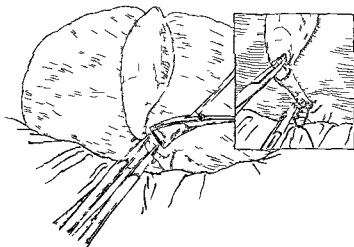


Fig 173.—The right lobe of the liver is reflected downward and to the left. The gall bladder is reflected upward and to the right. The cystic duct is exposed. The common hepatic duct is exposed. The triangle of Calot is formed by the common hepatic duct, the cystic duct, and the gall bladder.

bounded by the lower common hepatic duct and cystic duct which is known as the triangle of Calot and that ordinarily the cystic artery makes its way across this triangular area to the gall bladder. Continuing our traction upon Hartmann's pouch we shall pass a curved hemostat through Calot's triangle. After transfixing this space the clamp is opened *in situ* and thereby creates an aperture through which we can safely grasp the cystic duct with or without the cystic artery (Fig 173). By this technique any possibility of injury to the hepatic or common ducts

is avoided. A second clamp is placed above and the cystic duct divided between the two clamps. It is essential to be sure that any calculus in the cystic duct is milked back into the gall bladder before the clamps are applied. Every procedure is carried out by sight. At no time is a clamp inserted blindly or by sense of touch. By means of this precaution we have divided our cystic duct approximately close to its origin and without injury to the adjacent ducts. We will now doubly ligate the cystic duct with No. 2 chromic catgut; the first ligation will be tied below the clamp with the clamp still locked in place. The second ligation will be tied as the clamp is removed. We have therefore a double No. 2 chromic catgut ligation on our cystic duct. The clamp on the divided upper portion of the cystic duct exerts traction upward and to the right (Fig. 143) and the gall bladder is dissected from its fossa on the under surface of the liver. As we dissect the gall bladder from the liver we leave a flap of peritoneum on either side so that we shall be able to suture the two peritoneal flaps together and so close in the denuded area of the fossa of the gall bladder and prevent disabling adhesion. In the dissection upward of the gall bladder we meet a few blood vessels which are clamped before division and finally the remaining tag of gall bladder is excised from the liver. We now bring the edges of the peritoneal flap to either across the area occupied by the gall bladder with a No. 2 plain catgut and you will observe we have a completely dry and peritonized surface. A hot laparotomy pad is placed into the gall bladder wound and we will now proceed to do a typical appendectomy with incision of the stump. Finally we remove the laparotomy pad from the gall bladder area and a closed drain is introduced into Morrison's space—a surgical space represented by the area between the superior pole of the right kidney and the under surface of the liver. The object of this drain is purely prophylactic and is introduced as a precautionary measure in case the ligation on the cystic duct slips off so to drain the bile stained discharge that may arise from the cut surface of the liver. We have never felt the slightest need or expected to omit drainage after a cholecystectomy.

Before closing the abdomen we will excise a small piece of liver tissue from both the right and left lobe. It is our purpose to have Dr. MacNeal study these sections and ascertain if we have an interstitial hepatitis and whether it is of the biliary or portal type. We have collected considerable pathologic data on hepatitis derived from operative cases of gall bladder, gastric and duodenal ulcer, carcinoma of the stomach and appendicitis as well as autopsy material. We will close the abdominal incision in the typical manner using plain No. 2 catgut for peritoneum, No. 2 chromic catgut for the fascia, fine silk for the skin, and introducing five figure of 8 silk worm gut sutures  $1\frac{1}{2}$  inches apart. The cigarette drain is allowed to emerge at the upper angle of the incision.

**Postoperative Treatment**—The postoperative treatment of this patient will be that of a peritoneal cavity subjected to both injury and infection. We do not anticipate any infectious process but we have present theoretically the necessary elements for peritonitis. The patient will be placed in a Gatch bed in the Fowler position with an elevation of head and shoulder to 35 degrees. Nothing will be given by mouth for eight hours and pain will be controlled by  $1/5$  grain of morphin repeated in four and eight hours if necessary. We give morphin postoperatively for restlessness as well as pain. Rest, freedom from pain, and fluids are the essential requirements for recovery. If the patient is without pain but restless it is just as serious a menace to her recovery as if she had pain, so our indication for morphin is both pain and restlessness. During the first twenty-four to thirty-six hours we will give this patient by rectum a continuous proctoclysis after the method of Murphy. The solution is made up as follows: tap water 1000 c.c., glucose 10 per cent, soda bicarbonate 7 per cent. At the end of forty-eight hours the cigarette drain will be partially withdrawn and about one-half cut off. At the end of seventy-two hours the remaining portion of the drain will be removed. Enemata will be the rule for three days, then a mild laxative will be given. Soft diet for the first week, then modified regular diet until the patient is discharged.

**Ep crisis**—The report from Dr MacNeal on the pathologic examination of sections from the fundus of the gall bladder shows extensive loss of the corrugations of the mucous membrane. The entire mucous membrane is very atrophic as a result of chronic inflammation. The muscle bundles are approximately three times the normal thickness and there is an excess

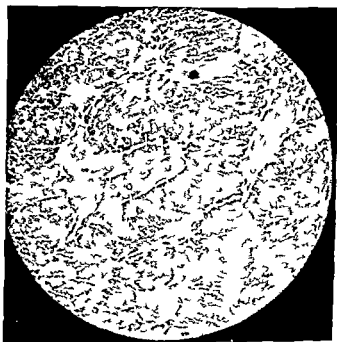


Fig 174—Chro      tt l h pat t   d rr gul   ca h   pp   dy  
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of round cell in the interstiti l connect e tissue of the muscle layer. The outer fibrous coat is thickened to a slight extent. The p ctu e indicates a most marked change in the lining mucous membrane with hypertrophy of the muscle. Sections of the gall bladder near the neck show th t the muscle l ye is also about three times the normal thickness and c nta ns

an excess of round cell in its interstitial connective tissue. The outer fibrous layer of the gall bladder is moderately thickened in this region and it is diffusely infiltrated with round cells.

Sections of the piece of liver show a moderate increase in connective tissue of the trabeculae of Glisson's capsule within the substance of the liver. In this connective tissue there are excessive numbers of round cells and in some places conspicuous small bile ducts apparently hyperplastic (Fig. 174). The columns of liver cells are well preserved but among the liver cells there are some very large nuclei. The endothelial cells lining the blood sinuses are somewhat more numerous and more deeply staining than usual and in these endothelial cells one finds an occasional mitotic division figure. In the sinuses there appears to be also slight excess of round cells and polynuclear leukocytes. The round cell infiltration in the connective tissue trabeculae is rather diffuse and it is impossible to recognize that it has a closer relation to the bile-ducts than the tributaries of the portal vein. The changes are evidently those of an early cirrhosis. The histologic picture is that of a subacute interstitial hepatitis and early cirrhosis apparently of more recent origin than the inflammation in the gall bladder.

We have typically combined with pathological and chemical studies the histological study of leukocytes combined with histopathology. With the Crise Hémoclique of Walden we combine with histological and pathological studies the method of Walden and will be so combined with histological and pathological studies the method of Walden and will be reported later.



## CLINIC OF DR WALTON MARTIN

ST LUKE'S HOSPITAL

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### THE RESULTS OF STAPHYLOCOCCUS INFECTION OF BONE

I HAVE several cases of staphylococcus infection of bone to present. I use the words staphylococcus infection of bone rather than osteomyelitis because in one of the patients the term chronic osteomyelitis might be misleading as the lesion is apparently of the subperiosteal cortical portion of the bone and because in discussing these cases I wish to keep the emphasis on the infectious organism.

I wish to call your attention first to the lesions caused by organisms of low virulence second to the frequency of multiple infections third to the significance of the sequestrum and fourth to the treatment of cutaneous scars adherent to the bone.

I have here a boy fourteen years old with a swelling over the upper portion of his right tibia. The skin over it is normal it is not red it does not pit on pressure the skin moves freely on the underlying tissue. When I press on the swelling it is slightly tender. The swelling is not hard as if made of bone but is firm and elastic. He has no temperature there is a normal leukocyte count the x-ray plate shows as you see (Fig 175) a small spot of increased density in the soft part about 2 cm from the medial condyle of the tibia evidently a fragment of detached bone. There is no defect or change to be seen in the head of the tibia the shadow cast by the protrusion of the soft parts is plainly visible.

This boy came to me for a swelling just below his knee about eighteen months ago. It was lightly tender and looked very much as it does today except that the swelling was less marked. I had an x-ray photograph taken and careful examination of



the plate showed no area of lessened density or irregularity in the bony outline. I have kept him under observation since then and have had plates made a number of times. Repeated examinations showed that the swelling has slowly grown larger. On one or two occasions he had a temperature of  $99\frac{1}{2}$  F. during these periods he was kept at rest. At the end of twenty four or forty eight hours the tenderness was gone and he has been able to go to school play games etc.



Fig. 15.—Small sequestrum filling cortical infarct of bone.

Two years and a half ago the boy had a wart on his hand. It was cauterized, became red and tender, and a few drops of pus. I understand formed under a crust. Two weeks later he noticed pain in the left knee and ankle. He had a chill followed by a rise of temperature. He was at boarding school and the attending physician put him to bed, made the diagnosis of acute articular rheumatism, and gave him salicylate. At the end of ten days it was obvious that the lower half of the left leg was

red swollen and edematous. The bone just above the ankle was extremely tender and an x ray taken at that time showed a distinct lesion of the lower end of the tibia close to the epiphyseal cartilage (Fig 176). The persistent pain just above the ankle joint, the absence of effusion in the joints and the history should have made a diagnosis easy even without the x ray plate.

He came under my care at that time. Under general anesthesia the soft parts were divided, there was pus beneath the

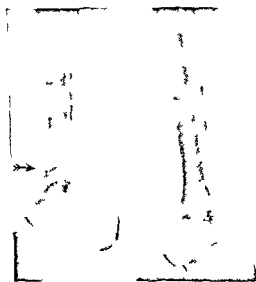


Fig 176 - Anteroposterior view of the lower end of the tibia and fibula.

skin in the cellular tissue. The periosteum was stripped from the medial surface of the bone for nearly the entire length of the tibia. There was a purulent infiltration of the whole lower end of the shaft of the tibia. The cortical bone was removed with a chisel and the interior of the bone exposed as far as the signs of infection of the marrow extended. The boy made a good recovery, the wound healed and the bone today seems sound.

Now what is the relation between the osteomyelitis two years ago and the swelling in the knee of the opposite side at present? If you question him closely he will tell you that he had a little pain in the right knee from time to time several months before the swelling appeared. That is his right knee was tender at the time he was suffering from active osteomyelitis of the opposite leg. The acute osteomyelitis was not the result of a direct invasion of the bone from an overlying infection of the soft parts; there had been no wound or injury to the ankle. It was obviously the usual hematogenous osteomyelitis. Staphylococci entered the blood stream probably from the infected wart. These staphylococci must have entered a vein, been carried to the right heart, have passed the capillaries of the lung and become lodged in one of the small capillaries of the tibia.

If a small number of staphylococci of moderate virulence are introduced into the veins of young rabbits or guinea pigs they set up purulent lesions in the osseous system especially in the metaphyses of long bones that is the expanded portion of the shaft of bone near the epiphyseal line. The organisms or clumps of organisms are arrested in the terminal capillaries of introsseous arteries at the points where conditions are especially favorable for their growth. If slightly larger numbers of virulent staphylococci are introduced into the veins of a young rabbit there are multiple purulent foci not only in the bones but in the lungs, liver, kidney, joints, etc. and all the traits in common between these two conditions have been observed. Clinical experience is in accord with these experimental findings. One sees patients in which the osteomyelitis only involves a few purulent foci in one or two places in the body and others in which only a single bone is involved and still the two common features are in evidence the infection of organisms setting up multiple foci but these lesions are confined entirely to the osseous system. Moreover when the organisms are arrested and start to grow they may set up a marked lesion in one place and a very light one in another. The body cells and the blood proper of the body fluid destroy numerous circulating and

lod ed staphylococci a small clump may become established in a capillary and manage to grow very slowly and with little damage to the surrounding tissue or a large mass of organisms may set up a very progressive and destructive lesion.

This patient has had a typical acute osteomyelitis of the lower end of the left tibia and I believe a much less marked lesion of the subperiosteal portion of the bone in the upper end of the opposite tibia too small to be detected by the x ray plate until the dead bone was detached. The small shadow is a minute bony sequestrum which has become separated. Without the history the swelling might easily have been mistaken for a sarcoma.

Under nitrous oxid anesthesia I am going to remove the sequestrum and if I am correct in my assumption I should be able to get positive cultures of staphylococci from the granulations and discharges in the neighborhood of the sequestrum. I do not expect to find pus under tension there are no signs of inflammation there has been no rise of temperature. I divide the skin transversely and come down after I have divided the subcutaneous tissue on the swelling. It seems to be covered by the deep fascia and the expansion of the tendon of insertion of the sartorius. This I divide and expose a mass of soft reddish granulation tissue. There is no pus or free fluid. In the center of the mass is a small sequestrum which I remove. It is a typical bony sequestrum with eroded irregular surface. I take a culture from the center of the granulation tissue. I am not going to scrape out the granulations. I am not going to expose or touch the bone. The process is over the dead tissue has been separated from the living the removal of the tiny sequestrum should be sufficient to terminate the process. The staphylococci here have evidently little virulence. The body cells have nearly destroyed them.

From practical experience and experimental work it is generally accepted that when a detached sequestrum is removed entirely prompt recovery follows. The significance of the sequestrum is that it harbors and anchors in the tissue pathogenic micro-organisms. A sterile sequestrum should disappear in

the tissues like a bone graft but sequestra are not sterile. Kenneth Taylor and others have repeatedly made cultures from them. They were always found swarming with organisms. The effort to sterilize detached sequestra in the body would seem to me to be particularly wrongly headed. There may be places in the body such as the femur where the dissection of the soft parts necessary to expose a small sequestrum seems ill advised and where it is better to open and keep open a sinus leading down to the dead bone for a time for frequently the sequestrum will become detached and loosened and eaten away so that it can be easily removed from the sinus. One may be doubtful as to when and how much bony tissue is dead but there can be no question when the bony tissue is separated and free that it should be removed.

I am now going to put a few horsehair stitches in the skin and put the leg and knee in plaster. If there is no temperature or pain I shall not cut down the plaster of Paris or change the dressing for ten days.

*Note*—Cultures taken from the granulations showed *Staphylococcus aureus*. The wound healed by primary union. There is now no swelling or tenderness over the tibia.

I remember a case reported by Kocher in which a similar lesion was found. It was mistaken for sarcoma. There was a swelling over the lower epiphysis of the right femur. It was painless. The patient had noticed it for a year. It had steadily but very slowly grown larger. At operation in a mass of soft granulations a small sequestrum was found. Cultures taken from the granulation showed *Staphylococcus aureus*.

I will next show a boy on whom I operated a year and a half ago for osteomyelitis of the tibia. He was then two years old. He had an extensive lesion extending from the upper metaphysis throughout the entire medullary canal. The boy had a high temperature and was very ill. The whole medullary canal was opened. He made a good recovery and left the hospital after six months with the leg soundly healed. He has no swelling of the right forearm and of the left wrist. These swellings are not tender. He has had no temperature since he

left the hospital eight months ago he is fat and well nourished and has not complained of pain in his forearm or wrist. These swellings were noticed when he was in the hospital recovering from the operation for osteomyelitis of the tibia. An x-ray plate shows a lesion of both arms (Fig. 177). I am keeping the boy under observation if he has any signs or symptoms of activity in these lesions or if I am able to detect a definite free sequestrum I shall operate. He has now no signs of infection.

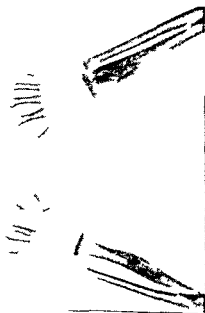


Fig. 177—Area of osteomyelitis in right distal forearm

nor do I make out as yet a detached sequestrum. Here again there has been a blood stream infection with staphylococci producing a well marked and extensive lesion in one bone with violent constitutional reaction and slight lesions in other bones with no constitutional reaction. A considerable clump of staphylococci possibly was arrested in a minute vessel in the tibia started to grow destroyed neighboring cells and was only overcome finally by the body cell after more favorable

conditions were created by operation. On the other hand staphylococci were arrested in the lower end of the left radius and the middle of the superficial portion of the shaft of the right radius and started to grow but here conditions were less favorable for their growth. The body cells have weakened the invading micro-organisms and lessened their virulence.



Fig 18—Osteomyelitis of the tibia. The growth marked by the arrow is the bone.

I have here an x-ray plate of the tibia taken a month and a half after the operation (Fig 18). It shows marked proliferation of the newly forming bone. A second plate taken 12 months later shows the same bone soundly healed (Fig 19). A few scale-like sequestra only were removed during this interval.

I wish now to call your attention to the area in the leg of both the patient. In the first patient (Fig 180) the catrux is about 15 cm long and 5 cm wide. It lies in the

center and firmly adherent to the underlying bone. At two points there are small dark crusts evidently dried blood. The surface epithelium is thin and is readily broken and rubbed away by trifling injuries leaving small abraded areas which bleed. Not only is the surface epithelium thin but on account of the adhesion to the hard underlying bone and skin is much more readily broken by glancing blows. The skin does not give and move aside on the underlying tissue as normal skin does. This



Fig. 179—S m b h w Fig. 178 m th l t

condition is an annoyance to the boy. In playing football and hockey or sliding bases in baseball he frequently injures the skin. The small abrasions heal but it is a condition that should be remedied. The upper two-thirds of the incision for osteomyelitis of the tibia is well placed. The tibia has as you know a subcutaneous medial surface so that any part of the tibia can be readily exposed. But it is far better to make the incision along the medial margin of this surface of the bone as in this



case than along the anterior crest. The resultant cicatrix is much less liable to traumatism but the lower portion of the scar passes over the center of the prominent malleolus where it is most easily injured. It should have been carried in front of or behind the malleolus. In this case there was no need of carrying the incision so far down as the lesion was above the epiphyseal cartilage.

In the second patient the scar is the same. It is broad adherent but in this case it extends the entire length of the



Fig. 180.—Adherent scar following osteomyelitis of tibia.

tibia. At one point there is bleeding; the mother says the boy injured it today kicking his shin with his boot.

I am going to operate on both these scars and I am now going to show the result of such an operation done two years ago for an exactly similar condition. I want to show the result a considerable period after the operation.

This boy came under my care for osteomyelitis of the tibia four years ago. An incision had been made over the medial surface of the upper portion of the tibia and there was a dis-

charging sinus. The x ray showed destruction of the bone along the epiphyseal cartilage so that there was a solution of continuity in the shaft at this point and involvement of the bone extending half way down the medullary cavity. The upper half of the bone was exposed, the periosteum incised and separated and the tibia cut through with a chisel just below the involved portion and this part of the shaft completely removed. The wound was packed and new bone gradually formed. In



Fig. 181.—M. vahl. ca. f. l. w. g. f. d. h. t. ca. t. r. i. x. w. t. h. t. a. p. l. a. t. f. f. t.

six months the leg was soundly healed and the boy was well but there was a broad adherent cicatrix over the upper half of the tibia which was frequently injured. Two years later this scar was excised, the skin incision passing through normal skin just outside the scar tissue. The cicatrix was made up of dense connective tissue firmly adherent to the bone which was slightly depressed at this point. This connective tissue was firm and unyielding and when it was cut away from the bone there were

numerous small bleeding points. The normal skin on the sides of the cicatrix was then undermined the undermining being carried on until the skin edges were free enough to be displaced and to come into contact with one another. If they had been directly sutured the skin would have been united over a depressed area in the bone bridging a shallow cavity which would soon have filled up with blood a condition unfavorable for sound healing moreover if union should take place the contracture scar would again become adherent to the underlying bone.



Fig 19.—Contracture flap elevated high

The wound was accordingly packed with tannic compresses pressure applied to stop oozing and a second incision made in the anterior surface of the thigh. The little boy was placid and a piece of ulcutane soft wax readily lifted out some half an inch larger than the depression left in the thigh and transferred to this region. The gauze packing removed all bleeding arrested and the fat placed on bare bone and the skin united over it by interrupted horizontal sutures. The wound on the thigh was sutured and the leg and knee put in plaster of Paris. At the end of two weeks the plaster was cut down the

sutures removed and the leg again immobilized in a plaster bandage. He left the hospital in 2 months.

I now show you the scar two years after this operation (Fig 181). It is movable on the deep parts, not sensitive; it is nowhere adherent to the bone. Both scars have stretched to some extent, but curiously enough the one on the thigh (Fig 182) from which the fat was taken much more than the one



Fig 183—New method of plating distal femur

united under some tension over the transplanted fat. I do not believe the transplant exists now as fatty tissue; it has probably been replaced by a loose areolar tissue. In any event it has served its purpose admirably. I took the fat from the front of the thigh because this situation was convenient.

I show also an x-ray plate of the bone (Fig 183). The half of the tibia removed has been replaced. The leg on the

numerous small bleeding points. The normal skin on the sides of the cicatrix was then undermined the undermining being carried on until the skin edges were free enough to be displaced and to come into contact with one another. If they had been directly sutured the skin would have been united over a depressed area in the bone bridging a shallow cavity which would soon have filled up with blood a condition unfavorable for sound healing. moreover if union should take place the contracture would again become adherent to the underlying bone.

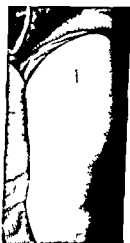


Fig 18.—Contracture of m. ilio-tibial.

The wound was accordingly packed the hot compresses pressure applied to stop oozing and a second incision made in the anterior surface of the thigh. The little boy was plump and a piece of subcutaneous fat was readily secured from that larger than the depression left in the thigh and transferred to this region. The gauze packing arrested all bleeding and the fat placed on bare bone with skin sutured over it by interrupted horsehair stitches. The thigh was sutured and the leg and knee put up in plaster of Paris. At the end of two weeks the plaster cut down the

## CLINIC OF DR EDWIN BEER

MOUNT SINAI HOSPITAL

### TUMORS OF THE BLADDER

DURING recent years a great deal of interest has been awakened in the diagnosis and treatment of tumors of the bladder. Prior to the last twenty five years tumors of the bladder were clinically a great rarity although their actual frequency was recognized by the pathologist since the end of the last century.

Owing to the perfection of the cystoscopic lighting system and the more easily handled cystoscopes the bladder has been more regularly explored and cases of tumor of the bladder have been much more frequently recognized clinically. Nowadays patients with the signs of bladder irritation or with hematuria are more regularly given the benefit of a cystoscopic examination and tumors of the bladder which had previously been treated by internal medication are identified and receive proper care.

Unfortunately many cases of tumor of the bladder produce symptoms intermittently which tend to lull the patient and his physician into a false sense of security and if the symptoms of irritation or the bleeding seem to respond to internal therapy some of these patients perhaps too many still fail to have the benefit of modern surgical exploration. If one looks back over one's hospital record for years it is quite astonishing however to see how many more patients are nowadays given the benefit of exploration with the cystoscope and proper surgical therapy than were so treated at the beginning of this century.

Pathology.—In this brief summary of the most salient feature of bladder tumor in outline the diagnosis and treatment an extensive pathologic description is unnecessary. A great variety of tumors are found in the bladder most of them primary although secondary tumors especially from the prostate or by direct extension from the uterus are not infrequent.

side operated on is now about    inch longer than the opposite leg

We have shown then in these cases very different and often multiple lesions produced by the same staphylococci. Some of these lesions are very chronic and are made up of masses of granulations with but trifling damage to the bone itself. We have also called attention to the necessity of inspecting the cicatrix following operations for osteomyelitis and after a considerable period has elapsed rectifying by suitable plastic operations adherent and easily traumatized scars.

surround the orifice. Naturally if secondary infection supervenes in such an occluded ureter and kidney a pyonephros will develop.

A peculiarity of papillomata both the benign and the malignant perhaps more characteristic of the former than the latter is the tendency to produce local implantations in the bladder mucosa so that at times one sees dozens of tumors of the same type scattered all over the interior of the bladder. The surface of the bladder directly opposite the primary tumor frequently shows the first implant as if the two surfaces had come to ether and the seed of the papilloma had been sewn on the opposed surface. This tendency to implant secondary growths is also very frequently seen at the neck of the bladder where innumerable small papillary growths may be implanted about the circumference of the sphincter. Very rarely strange to say are secondary papillomata found in the urethra which is probably due to the fact that they are washed out by the strong current at every emptying of the bladder so that the implants do not get a chance to take. Papilloma which start in the pelvis of the kidney behave somewhat similarly in that they are liable to produce multiple implants along the ureter and even in the bladder.

In addition to these various epithelial primary growths there are connective tissue growths which are much rarer such as myomata fibromata sarcomata and lymphosarcomata as well as rare epithelial growths starting in some of the embryonal structures about the urachus.

**Symptoms**—The typical symptom of tumor of the bladder is painless hematuria. The hematuria is usually complete that all the urine is mixed with blood and may even contain clots. If the tumor is situated just in the neck of the bladder occasionally the bleeding is terminal. Only after infection of the bladder when cystitis sets in do the patients have marked irritability of the bladder and with the irritability more or less pain. In neglected cases the pain may be a dominant symptom although at the beginning of the clinical picture it is most unusual. Frequency varies very markedly. Most patients how-



The most common primary tumor of the bladder are in the epithelial cell of the mucous membrane and present themselves as delicate or more solid papillary tumors a very delicate structure usually but at times when the fronds are a little flattened or the pedicle is particularly thick rather firm looking papillary growths are produced. The bases of such papillary tumors are usually normal bladder mucosa and show no sign of infiltration. On the other hand the malignant tumors look very much like the benign macroscopically and are often undoubtedly mistaken for benign tumors which probably led such an expert pathologist as Rokitsansky to call this whole group of papillary tumors malignant growth.

Microscopically however the two types of papilloma can be distinguished with some accuracy. In the malignant tumors there are marked changes in the nuclei of the epithelial cells and there is much more irregular growth of the cells as pointed out by Zuckerhاندl some twenty years ago and more recently by Buerger.

*In addition to these two types there is an infiltrating papillary carcinoma in which the base of the tumor in the bladder wall shows carcinomatous infiltration and there is also a more solid type of carcinoma without any extensive papillomatous growth which may be the epithelial in origin similar to the epithelium of the papillary carcinoma above described or made up of squamous cell epithelium looking like typical epithelial dermoid growth.*

The adjacent lymphatic glands in the primary tumor which are malignant are involved rather late the deposits being in the iliac group of glands and occasionally in some lymphoducts which is between the iliac group and the bladder. It is closer to the bladder than the first group of glands. The first site of these papillary growths as well as the more solid growths is about the ureteral orifice and on the base of the bladder often situated close to the ureter so that they may press on the ureter producing hydro-ureter and hydronephrosis of the corresponding kidney. The benign papilloma may however rarely occlude the ureter even though a large mass of papilloma

With the cystoscope in the bladder unless there is a very active hematuria the examining eye can readily detect the growth within the bladder and an experienced cystoscopist can very frequently diagnose whether the tumor is benign or malignant from the cystoscopic picture

The benign tumors are delicate fluffy warty growths of pale pink color the vessels in the fronds often being visible. The different branches of the tumors float innocently in the irrigation fluid and the underlying mucous membrane of the bladder looks absolutely normal

On the other hand the following characteristics are often present in the malignant papillary growths there is often more or less necrosis of and exudate on the papillary masses there is also a much more solid union of the fronds so that the tumor looks like a mixture of a papillary and a solid growth and the underlying and adjacent mucous membrane of the bladder is often edematous and thrown into folds suggesting a blockade or an involvement in the lymph channels of the mucosa and submucosa. It is often difficult however to be absolutely sure in the diagnosis between the malignant and the benign papillomata and it is advisable to excise specimens when in doubt and submit them to microscopic control. Although this control is not absolutely reliable in the great majority of cases it is very helpful

Another aid in distinguishing between benign and malignant papillomata is the response to the high frequency treatment whereas the benign tumors melt away under the current the malignant papillomata are very much more obstinate and do not respond to the current by rapidly disappearing. On the other hand in the more solid tumors in which there are definite nodules where the growth is flat and only moderately raised from the bladder wall the diagnosis is much more simple and in these cases one can often arrive at the correct diagnosis without excising a specimen for microscopic study

Another very valuable aid in deciding the size of the growth and the extent of infiltration in the bladder wall is the cystographic x ray examination made with air insufflation or with

ever unless the tumor is large do not complain of frequency as an initial symptom though later on as the tumor gets larger and larger and especially if it involves the neck and if infection inter-venes frequency and dysuria may be very marked symptoms

If complications set in such as occlusion of the ureter symptoms referable to such occlusion may develop though in most cases until infection sets in such an occlusion may go unrecognized. It must be borne in mind that all patients with tumors of the bladder do not bleed. Some of the largest tumors that I have seen have never produced a hematuria though according to the history it would seem in one case as if the patient had carried the tumor over twenty years complaining only of some bladder irritation and urgency. Some patients will call attention to the fact that they have noticed flakes of material in their voided specimens which on analysis have proved to be broken off fragments of the delicate papillary growths. Others again pass encrusted fragments of tumor which suggest until carefully studied the presence of calculi.

Those patients with infiltrating growths that have been neglected or who have been operated on and have recurrences in the bladder may suffer terribly and have to empty the bladder very frequently and with a great deal of pain usually associated in each and every act with more or less blood and pus because at this stage they are almost all infected.

Metastases from malignant tumors of the bladder occur not only in the local gland where local tumors may be felt but also in the skeletal system in the liver and in the lungs where they produce symptoms if they attain any size or persist on any essential anatomic part.

Diagnosis.—From what has been said in the introduction it is evident that every patient with irritation of the bladder and every patient with painless hematuria should have the benefit of a modern cystoscopic examination.

The technique of cystoscopy has been acquired by so many men that the excuse no days for neglecting this recently demonstrated method in interpreting the symptoms referred to

it was impossible for the profession as a whole to employ the transurethral method developed by Nitze. Some new and simpler transurethral procedure had to be evolved and for many years those of us who were interested keenly in this problem turned our minds to simplifying the transurethral methods. Blum of Vienna originated simple snare and forceps which could be introduced through the ordinary catheterization cystoscope. Caiper and Kuttner produced rather elaborate instruments similar to Nitze's operating cystoscope but all of these attempts including Young's rongeur failed to solve the problem. In 1910 after considerable experimental work with the high frequency currents of Oudin and D'Arsonval it was found that with a properly insulated electrode of 6 Fr. caliber the current could be brought in contact through the cystoscope with benign tumors of the bladder and quickly by virtue of its cauterizing and perhaps ionization effect destroy the neoplasm. This simple technic which any cystoscopist could readily master really made for revolutionary changes in the whole problem.

Since 1910 many thousands of cases of benign tumor have been treated successfully by the high frequency currents. In my experience the Oudin current has been more satisfactory than the D'Arsonval or bipolar current though of late years it has been impossible in America to obtain an electrode adequately insulated to carry the monopolar or Oudin current. Since a year and a half these electrodes have been manufactured abroad for me by a Swiss firm and are so efficient that in my work I rarely have to make use of the bipolar current and the electrodes which have been manufactured for me in Germany and America.

In a rather extensive analysis published in 1915 I called attention to the most striking differences between monopolar and bipolar currents. If it were possible to apply the bipolar current to a papillary growth which could be raised from the bladder wall at the same time as the current was run through it it is perfectly conceivable that owing to the distant effect in the pedicle the pedicle might be cauterized and the blood supply of the whole growth destroyed at the very first sitting. But as yet it has been impossible to construct an instrument which

bromid In these pictures the tumor can readily be seen projecting into the bladder if air is used or as a defect in the filling if bromid is used to make the picture. Although these latter methods are very helpful and should be employed whenever in doubt they are not regularly reliable as I have been repeatedly fooled by defects in patients who could not be recystoscoped and concluded from the cystogram that the tumor was situated not only where I had seen it at the first cystoscopy but that there was an extension to another part of the bladder which at operation proved to be uninvolved. In deciding the amount of infiltration of the bladder wall the cystogram may show marked deformity owing to the infiltration of the various wall of the bladder.

Another valuable sign is the vaginal or rectal examination which should regularly be made in all doubtful cases and the examining finger may detect very readily the increased resistance corresponding to the area of the bladder wall that is infiltrated by the malignant growth.

**Treatment**—In discussing the treatment of bladder tumors one naturally limits oneself to the primary and common types of tumor namely the papilloma the papillary carcinoma and the infiltrating carcinomata. Until some twenty years ago these tumors had been regularly either left alone as nonmalignant or operated on either by the transperitoneal or extraperitoneal suprapubic route. The results of the operative treatment were so unsatisfactory that some surgeons went so far as to recommend a deflection of the urinary stream by double nephrostomy so as to put the bladder at rest and give the patient some comfort leaving the original tumors or tumor in the bladder alone.

As a consequence following the open operation was the regular sequence of events the profession was thrilled when Nitz published his series of bladder tumors treated with the operating cystoscope transurethrally. There can be no doubt that this series of well observed cases indicated the direction of future development but owing to the intricacy of the cystoscopic mechanism and the difficulty of acquiring the necessary technique

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will at the same time raise the growth from the bladder wall and allow the current to run through the same instrument that raises the growth. The distant action of the bipolar current renders it less controllable than the monopolar current. Moreover the explosive force of the monopolar current breaks off pieces of the growth rapidly while the operator is cauterizing the papilloma. The response following treatment with the high frequency currents is very striking. Gas is generated as soon as the current is turned on and the fronds of the tumor are blanched. Subsequently at the point of contact the tumor is seen to be carbonized. The gas that is generated appears to be hydrogen and every once in a while small collections of this gas in the anterior wall of the bladder provided the tumor is in the vicinity of the gas bubble can be heard to explode within the patient's bladder. The same gas is generated when a piece of meat under water is treated with the high frequency current. Originally it was thought by some though never believed by me personally that the high frequency treatment might be used in carcinomata. I have always avoided its use in frank malignancies except as a hemostatic agent though I was always ready to admit that very early malignant changes in tumors that looked frankly papillomatous might be successfully treated with the high frequency current. Although the high frequency cauterization has undoubtedly had great success and has simplified the treatment of benign papillomata of the bladder still there are very definite contraindications to its use which contraindications are not thoroughly appreciated by the profession as a whole. Everywhere one sees numerous cases that have been repeatedly cauterized with this current who were not fit cases for this type of therapy. Such attempts to continue in the use of the high frequency current when one is not getting the proper responses are liable to bring the method into disregard.

For many years I have taken the attitude that all malignant tumors should be excluded from the high frequency treatment as well as all papillary growths that do not respond in the typical manner after one or two treatments. Moreover extensive tumors at the neck even though they be benign should not be

treated with the high frequency current as it is almost impossible for the operator to make careful systematic applications of the current at the neck of the bladder. A fourth group that should be excluded from this treatment are those cases which bleed profusely at each introduction of the cystoscope and therefore cannot be properly visualized. In addition patients who are intolerant to cystoscopy naturally should not be so treated unless the operator is willing to use a general anesthetic which may be a dangerous procedure in view of the fact that the patient's co-operation is so essential in deciding how far one may push the electrode in treating the growth. Whereas the patients complain of no pain while the tumor is being treated provided the electrode touches only the tumor as soon as the normal bladder wall is struck by the electrode the patient complains of pain which guides the operator and which guide would be lost under general anesthesia.

It is also a question whether patients with very extensive papillomatosis of the bladder should be treated in this way. Having tried the method on such cases I have come to the conclusion that with our improved cautery technique through a suprapubic incision one gets more satisfactory permanent results more quickly than by the transurethral method. If we exclude therefore all the above cases from the transurethral method the surgical removal of the growths in these cases must be employed.

As said above experience in the past has shown that surgery has been followed by recurrence in the great majority of cases. The reason for the recurrences it seems to me is quite evident. Even benign papillomata when operated upon by the older suprapubic methods regularly recurred because of the inherent property of these epithelial cells to grow on denuded or wounded surfaces. Therefore in trying to improve upon the old method of operating the modern surgeon must develop a method which prevents any implants; he must attempt to destroy the tumor *in situ* with a cautery; he must sponge as little as possible; he must operate on an empty bladder so that the wound is not flooded with an emulsion of tumor cells as soon as the suprapubic



incision reaches the bladder cavity and he must protect the perivesical space and the wound in the abdominal wall so that no accidental implants may result.

During recent years many improvements have been introduced into the surgical technique of the removal of bladder tumors and perhaps the most important step has been the extraperitoneal liberation of the bladder which allows the surgeon to draw the organ well out of its peritoneal and perivesical coverings so that when the bladder is opened it is practically two-thirds out of the abdomen. This method of approach has been favored by most recent writers including Squier, Voelker, Latzko and myself after having given the transperitoneal approach a fair trial. The mortality in the extraperitoneal approach is much higher than in the intraperitoneal approach and in the former it is impossible to mobilize the bladder in such a way as to prevent contamination of the wound with tumor cells.

The operative removal of tumor in the bladder whether they be benign papillomata, papillomatosis, malignant papillomata or infiltrating papillary carcinomata should be along the following line:

The bladder should be washed out gently prior to operation and after the organ has been emptied completely the patient placed in the Trendelenburg position. A 1 1/2 inch median supra pubic incision is made down to the bladder which is not opened. The bladder is then separated from its peritoneum the dissection being begun at the apex and the urachus being liberated. The latter is doubly clamped and cut the upper stump is ligated and the lower end attached to the apex secured with its attached clamp. The bladder is then drawn toward the symphysis while the operator separates the peritoneum from the posterior wall of the bladder. If the tumor is known to be on the surface of the bladder it is well to expose the overlying peritoneum and immediately close the opening made in the peritoneum. After completing the dissection pull down to the ureters a few branches of the vesicular vessel being tied in the midline the bladder is drawn further and further out of its perivesical bed and being held in this position by means of a towel kept open with a

Balfour self retaining retractor is thoroughly protected with heavy gauze pads to prevent contamination. Then the bladder is incised either on its posterior anterior or lateral wall depending upon the site of the tumors or tumor. As soon as the bladder is opened any fluid which might have accumulated during the above steps of the operation or might have been left behind by incomplete evacuation through the catheter is disposed of either by gentle sponging or by suction apparatus. As the incision in the bladder is enlarged the growth or growths become visible and with the electric cautery they should be completely destroyed *in situ* with as little sponging as possible. If the tumor is a benign papilloma or multiple papillomata corresponding to the papillomatosis cases as mentioned above the complete destruction with the cautery of the well exposed tumor or tumors well into the bladder wall without resection of the underlying wall will suffice. If however the cystoscopic and the preoperative microscopic examination and the palpation at the time of exposure of the bladder suggest a malignancy the underlying bladder wall must be widely excised preferably with a cautery knife. The palpation of the bladder wall from without is the most valuable aid in deciding the extent of the malignant infiltration underlying the bladder tumor.

In case the tumor involves a ureter orifice and has obstructed same it is well to make a cautery resection of the tumor with the ureter attached and subsequently having drawn a ligature around the ureter cut off the tumor from the ureter by section of the ureter 2 cm. from the bladder. In such cases the ureter must be reanastomosed with the bladder by the simplest technique available which consists of puncturing a healthy part of the bladder wall and drawing the ureter through after splitting it into two lips and attaching same on the inner and outer surface of the resected bladder with a couple of chromic stitches. Having either destroyed the tumor *in situ* or having destroyed it and resected the bladder that is involved in case of malignancies it is recommended to burn the incision in the bladder wall with the cautery removing the Carmalt clamps which have been placed upon the edge of the bladder opening during the opera-

tion By cauterizing this whole edge of the incision all implants which might accidentally have been made will be destroyed and as no perforations of the bladder wall have been made by using tooth clamps—for example Ochsner type—there will be no danger of producing deep implants close to the edge of the incision Having cauterized the whole incision all the Carmalt clamps should be removed and the bladder allowed to drop back into the pelvis the table lowered and the wound filled with strong alcohol for five minutes with the object of coagulating any viable tumor-cells which might have been broken off<sup>1</sup>

Having sponged out the alcohol the position of the table is again changed and the charred bladder incision is closed with a running suture of plain catgut which goes through all the walls and an external suture of chromic gut. When this closure is well under way the tied off ureter in cases of ureter reimplantation is brought in to some healthy part of the bladder and attached The whole of the bladder incision is closed leaving an opening for suprapubic drainage A rubber-dam is placed on either side of the bladder and brought out through the suprapubic incision alongside of the tube and the abdominal wall is closed in layers

Since adopting this technique some five or six years ago and carrying out every step with meticulous care the immediate as well as the end results have been markedly improved The mortality is somewhere around 5 per cent. whereas the mortality in the transperitoneal operation was more than twice that Moreover with this method of operating one has perfect control over possible implants which might be broken off from the original tumor which one would not have with the transperitoneal operation

It must be evident to anyone working in these lines that a method of operation that is successful in benign papillomata which cannot be treated transurethrally and in papillomatosis cases meets the indications of an operation This is really more of a test of the adequacy of an operative procedure than would

<sup>1</sup>This technique has been fully described in the author's paper in the *Annals of Surgery* January 1921

be the results obtained in infiltrating growths where the operator cannot be sure of the extent of bladder wall involvement at the time of operation

**Radium Therapy**—Having discussed the transurethral and the operative methods we come to a very mooted field namely the field of radium therapy. There can be no doubt from published reports that radium is a most useful agent in the destruction of tumors of the bladder. Whether it should be restricted in its use to definite inoperable cases or whether it should be used indiscriminately in all cases malign and benign seems very difficult to decide at the present time. There is a very definite group of tumors of the bladder in which the malignant growth is situated at the neck and for which surgery can offer nothing but a complete removal of bladder prostate and seminal vessels. In malignant growths situated in this position it is possible that radium may offer a great deal and surely in this type of inoperable case the use of radium is definitely indicated.

On the other hand tumors that are definitely removable by operation it seems to me should still have the chance of cure that surgery offers as the radium treatment must of necessity be a hit or miss procedure in view of the fact that the operator who introduces the emanation needles either transurethrally or through an opening in the bladder made by suprapubic incision does not know at the time of the introduction of his needles how wide an area should be radiated or how deeply the needle should be embedded. On the other hand by such an operation as outlined above the surgeon feels the extent of the infiltration and can go as wide of it in his cautery resection as indicated.

It has been claimed by some that preoperative radiation or combined radium and high frequency treatment give very satisfactory results. With this personally I have had no experience though I have noted that bladder tumor cases that have been treated with the deep x ray seem to respond more rapidly to the transurethral high frequency treatment. Experience along these lines however is so limited as yet that conclusions cannot be drawn.

Another interesting point in connection with the treatment

of bladder tumors by radiation was brought to my notice some years ago in a patient who refused operation and submitted for months to transrectal and transabdominal radiation. Finally when he came to operation he presented such an extensive growth that it seemed useless to attempt a crutery resection. Nevertheless rather than do a cystectomy a very extensive resection was done and the patient much to my surprise has remained well and free from recurrence for over three years. In this case under all the rules of the game one would have expected the patient to succumb with a recurrence long ago and one cannot help but feel inclined to attribute part of the good result to the extensive preoperative radiation. It might well be worthwhile giving all patients before bladder resections a course in deep x-ray therapy which will delay the operation only a short time making the operation somewhat more difficult on account of adhesions but perhaps improving the end results.

**End results**—In the transurethral treatment of bladder tumors with a high frequency current the great majority can be cured definitely by this treatment. These patients must be controlled regularly and should be seen while under treatment every two weeks until the growth is destroyed and then regularly every three months for a period of one year. If throughout this year's period there is no evidence of recurrence the chances are that the patient is permanently cured. My original cases so followed for years have remained absolutely well. The benign tumors which cannot be treated transurethally and the papillomatous cases with the operative technique outlined above are cured with great regularity so that the old idea of papillomatous disposition gradually being given up by me.

As far as the papillary carcinoma tumors are concerned the above crutery operation with excision of the base has given me a large number of permanent cures. In the infiltrating hard tumors of the bladder wall perhaps especially in the squamous cell tumors the results are much less satisfactory despite careful adherence to the technique described. In these cases I doubt very much whether the life of the patient is permanently cured and I believe the reason that the patient is

recurrences is that the surgeon at the time of operation fails to remove all the tumor by virtue of the fact that it is impossible to determine how extensively the tumor has infiltrated the lymphatic channels

There is also another point in connection with this whole problem that in closing should be emphasized. It is not generally appreciated that there is a marked biologic difference between malignant tumors. To those of us who see a large number of malignancies in the bladder and prostate it is very evident that tumors that macroscopically and microscopically are indistinguishable behave very differently. Some remain localized for a long time and produce no metastases whereas others grow like wildfire and produce either metastases or death. The very fact that tumors of the same constitution and appearance vary so in their biologic activities makes it particularly difficult to arrive at a satisfactory conclusion as to which is the proper method of treatment as based on published end results.



## CLINIC OF DR. CLARENCE A. McWILLIAMS

### SKIN AND CANCER HOSPITAL

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#### TRUE PANCREATIC CYST

I BRING this patient before you today to illustrate nature's wonderful curative powers when aided by helpful surgical assistance. She is now sixty-two years of age with considerable adipose development and the mother of 4 children. She first came into my hands in the Presbyterian Hospital in October 1910 complaining of pain in the left upper abdomen. The first attack of pain dated back fourteen years. It was of a sudden tearing severe character radiating upward to both shoulders starting at the left upper quadrant of abdomen lasting for about an hour without any cessation. These attacks came on at intervals of six months had no reference to meals and would come at different times in the day. After the attacks would belch a great deal of gas. Never vomited during these fourteen years nor was jaundiced nor spat up any blood. Five weeks before admission the patient had an attack which lasted all night. The pain in the left upper quadrant was very severe and constant and there was a great deal of vomiting. Patient had to have morphine. Ever since then there has been a dull aching pain in the left upper quadrant which is only relieved by pressure or lying on that side. The pain has gradually gotten better and the vomiting also. Has become thin and lost a great deal of flesh. Examination on admission showed heart and lungs normal. In the upper abdomen 4 inches below the ensiform there is a large transverse indistinct soft mass not nodular but smooth and only slightly tender. On percussion over this mass there is dullness. Ewald's test breakfast gave 90 c.c. watery fluid with no mucus and with very little food. Total acidity 6 c.c. or 0.71 per cent. free hydrochloric acid 2 c.c. or 0.07 per cent. Test





an indistinct tumefaction. It seemed probable that the cyst had filled up again. So at exploration on September 15 1911 an enormous cystic mass was felt behind the stomach to which it was tightly adherent. An opening was made through the gastrocolic omentum and the cyst wall was held to the abdominal wall and a very large amount of chocolate colored fluid was evacuated. The finger inserted went into an enormous cavity extending over to the right in front of the vena cava and above to the diaphragm. A small section of the wall was excised. Excision of the whole sac was deemed absolutely impossible because of its firm adherence to all the important surrounding structures. The cavity was swabbed out with iodine solution three strips of gauze were packed to its bottom and a drainage tube was inserted. The opening in the cyst was sutured to the abdominal wound edges.

For the next seven years she dressed the wound herself wearing all the time the drainage tube. In May 1918 she was readmitted complaining of the same colicky pains as previously. The drainage tube was about 3 inches long emitting a small amount of discharge each day. Five days before the last admission there was a sudden increase in the discharge from the sinus which became greenish yellow macerating the skin prior to which the discharge had been colorless and did not irritate the skin. The previous day she passed from the sinus a peanut she had eaten the day before.

Examination of the discharge showed the presence of pancreatic ferments. The ingestion of carmin by the mouth was followed by its appearance from the sinus. Three months later in July 1918 she was readmitted because of severe colicky epigastric pains. The discharge from the sinus became velvety looking like bile and examination of the discharge gave a marked bile reaction with rapid digestion of protein and starch. Bismuth injected into the cyst through a catheter was seen through the fluoroscope to mingle with bismuth ingested by mouth. For these reasons it was thought that the cyst wall had perforated into the alimentary canal probably the duodenum caused by pressure of the drainage tube. No operative pro

of feces showed only slight mucus slightly acid marked reaction for urobilin faint reaction for blood Microscopically no pus or red blood cell and no excess of fat

A positive diagnosis could not be made but in view of the attacks of pain with the indistinct high abdominal mass an exploratory laparotomy was undertaken on October 28 1910 Gas and ether were administered and a vertical incision was made through the inner third of the upper right rectus There was no free fluid in the abdomen nor were there any adhesions between the anterior abdominal wall and the underlying viscera The gall bladder was normal On inserting the hand there was felt a large soft smooth fluctuating mass the size of a large grapefruit extending over to right of midline and to left under the spleen and above high up to the diaphragm There was no doubt that it was a non pulsating collection of fluid so a syringe was inserted after padding off the intestines below obtaining chocolate colored odorless turbid fluid The needle was inserted through the gastrohepatic omentum After withdrawal of the needle the wall of the cyst was drawn up to the abdominal opening and a trocar and cannula were inserted evacuating over a quart of fluid A large rubber drainage-tube was sewn in by a purse string suture and the cyst wall was sutured to the abdominal wall Culture of the cyst gave *Staphylococcus albus* (contamination?) Examination of the fluid from the cyst showed it to be a thick fluid of faintly greenish yellow color of faintly alkaline reaction with a specific gravity of 1022 Fat splittun ferment was markedly present and also a decided trypsin reaction with the presence also of diastasis ferment The convalescence was smooth and in twenty four hours about 8 ounces drained through the tube into a drainage bottle From these findings it was evident that we had to deal with a true pancreatic cyst whose etiology was unknown? The patient had been no previous abdominal trauma at any time The drainage-tube was gradually forced out and was left out permanently for months after the first operation

She was readmitted in September 1911 complaining of continuous severe pain in the epigastrium here there was felt

an indistinct tumefaction. It seemed probable that the cyst had filled up again. So at exploration on September 15, 1911, an enormous cystic mass was felt behind the stomach to which it was tightly adherent. An opening was made through the gastrocolic omentum and the cyst wall was held to the abdominal wall and a very large amount of chocolate colored fluid was evacuated. The finger inserted went into an enormous cavity extending over to the right in front of the vena cava and above to the diaphragm. A small section of the wall was excised. Excision of the whole sac was deemed absolutely impossible because of its firm adherence to all the important surrounding structures. The cavity was swabbed out with iodine solution, three strips of gauze were packed to its bottom and a drainage tube was inserted. The opening in the cyst was sutured to the abdominal wound edge.

For the next seven years she dressed the wound herself, wearing all the time the drainage tube. In May, 1918, she was readmitted complaining of the same colicky pains as previously. The drainage tube was about 3 inches long, emitting a small amount of discharge each day. Five days before the last admission there was a sudden increase in the discharge from the sinus which became greenish yellow, macerating the skin prior to which the discharge had been colorless and did not irritate the skin. The previous day she passed from the sinus a peanut she had eaten the day before.

Examination of the discharge showed the presence of pancreatic ferments. The ingestion of carmin by the mouth was followed by its appearance from the sinus. Three months later in July, 1918, she was readmitted because of severe colicky epigastric pains. The discharge from the sinus became yellowish, looking like bile, and examination of the discharge gave a marked bile reaction with rapid digestion of protein and starch. Bismuth injected into the cyst through a catheter was seen through the fluoroscope to mingle with bismuth ingested by mouth. For these reasons it was thought that the cyst wall had perforated into the alimentary canal, probably the duodenum, caused by pressure of the drainage tube. No operative pro-

cedure was deemed advisable. In March 1919 she was readmitted because of epigastric pain. There was very little discharge from the sinus and the tube had been discontinued. There was much indigestion. A diagnosis of chronic cholecystitis was made but operation was refused. In three months (July 1919) the sinus healed completely and has not reopened since.

In February 1920 she was suddenly seized with a onizing colicky epigastric pain with fever and was taken in an ambulance to the Patterson Hospital New Jersey where Dr MacLay removed a gall bladder which contained fifty four stones. He saw no evidence of the pancreatic cyst save adhesions presumably it had become obliterated through adhesion of its walls. She is now well save for some slight indigestion. There are no herniæ present in the abdominal wall.

The etiology of such a cyst is unknown. It is conceivable that a hemorrhage might have occurred in the substance of the pancreas and not have been absorbed. This blood might have so irritated the walls of the cyst that it continued to secrete absorption of the fluid being less than secretion causing the cyst to gradually enlarge. But what caused a hemorrhage in such a deep-seated and protected organ as the pancreas? Pancreatic cysts are more uncertain in their etiology than hemorrhagic pancreatitis for we know that the latter is due to infection at least. Marsupialization is the only possible treatment in such a cyst combined with vigorous scrubbing to remove its lining cells and the subsequent applications of pure iodine.

## CLINIC OF DR MORRIS K SMITH

ST LUKE'S HOSPITAL

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### FRACTURE CLINIC

#### UNRECOGNIZED FRACTURE

THE first patient I want to show you today is J M. He came to the clinic when fifteen years of age complaining of injury to his left elbow. The story was that while wrestling four days before he fell on the elbow since when it had been disabled. Examination showed moderate swelling, limitation of motion and well defined tenderness over the inner condyle. A radio graph (Fig 184) was made. There are no evidences of fracture in it as you can see. This was somewhat of a surprise in view of the definite localized tenderness; however a diagnosis of contusion was given and we felt that a prompt recovery could be anticipated.

The boy returned two or three times and then dropped out of sight until about six weeks after the injury when his father brought him back stating that the elbow was not getting better as he had expected. Motion was still very limited. Another x ray was taken which shows the condition you see in Fig 185. If you compare the injured elbow with the uninjured and with both in Fig 184 you observe that the internal epicondyle is in two fragments. Let me quote from the report of the radiologist Dr LeWald: 'There is production of new bone or calcification about the inner condyle of the left humerus. This confirms the probability of there having been an epiphyseal fracture involving the center of ossification for the epicondyle.'

In commenting on the first radiograph Dr LeWald had said

Service: D H H M I y l d D F S M th w St L k H p t f  
N Y k

cedure was deemed advisable. In March 1919 she was readmitted because of epigastric pain. There was very little discharge from the sinus and the tube had been discontinued. There was much indigestion. A diagnosis of chronic cholecystitis was made but operation was refused. In three months (July 1919) the sinus healed completely and has not reopened since.

In February 1920 she was suddenly seized with agonizing colicky epigastric pain with fever and was taken in an ambulance to the Patterson Hospital, New Jersey, where Dr. Maclay removed a gall bladder which contained fifty-four stones. He saw no evidence of the pancreatic cyst save adhesions; presumably it had become obliterated through adhesion of its walls. She is now well save for some slight indigestion. There are no herniæ present in the abdominal wall.

The etiology of such a cyst is unknown. It is conceivable that a hemorrhage might have occurred in the substance of the pancreas and not have been absorbed. Thus blood might have so irritated the walls of the cyst that it continued to secrete, absorption of the fluid being less than secretion, causing the cyst to gradually enlarge. But what caused a hemorrhage in such a deep-seated and protected organ as the pancreas? Pancreatic cysts are more uncertain in their etiology than hemorrhagic pancreatitis for we know that this latter is due to infection at least. Marsupialization is the only possible treatment in such a cyst combined with vigorous scrubbing to remove its lining cells and the subsequent applications of pure iodine.

no notable swelling or discoloration. He would make no effort to move the leg. An x ray (in one plane) was negative. The diagnosis of anterior poliomyelitis therefore seemed most probably the correct one and the child only escaped being hospitalized as such by a second x ray study which in a different exposure showed a long oblique fracture of the tibia without displacement.

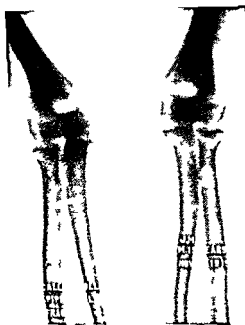


Fig. 185—Same as Fig. 184, with the tibia in its normal position. The child became physically fit who previously was disabled.

You see that J. M. has perfect function and has suffered no harm because the condition was originally unrecognized. However, we should have been suspicious on account of the very definite localized tenderness, a good illustration of the fact which we are prone to forget that the x ray supplements but does not take the place of clinical diagnosis. Had we guarded our diag-



that an epiphyseal injury could not be ruled out. That comment we had failed to take into account. The lesson I want to impress upon you is that an early negative radiograph does not definitely rule out fracture. This case is an illustration as regards epiphyseal injury. Occasionally in adult bones the deposition of callus is the first x ray evidence of slight fracture.



Fig 184—The femur looks like the tibia. The fracture is displaced.

I would remind you too that occasionally a tension fracture is not seen in one exposure when quite apparent in another so that both anteroposterior and lateral views should be made in all suspected cases. An illustration of this very much in point was a small boy seen during the infantile paralysis epidemic with the history that for several days he had not moved his left leg. The case was a story of a fall from the crib as the initial event. On examination the child did not appear in pain and the case was

radial epiphysis which you see in Fig. 188. The injury occurred



Fig. 186—Separation of the radial epiphysis with displacement. At the time the injury occurred the patient was a child.

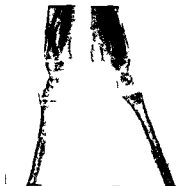


Fig. 187—Same as Fig. 186. Eight months later. Not only has the fracture completely corrected itself, but the patient is now a young man.

three weeks before when she was in the country. It did not cause much pain and she would use the wrist fairly well when

nosis properly when we first saw the patient the parents would have been spared the anxiety of the boy's failure to get well in the expected time and we the embarrassment of having finally to reverse our diagnosis. That there are possibilities of unpleasant legal complications in such a situation you can easily imagine.

### SEPARATION OF LOWER RADIAL EPIPHYSIS

The next patient is R. R. who came to the clinic one and a half years ago with an injury of the right wrist. He was thirteen years old at that time. I want you to examine him before we proceed with an account of his case. You observe that function of the right wrist has suffered in no way, his motion being equal on both sides. There is likewise no deformity remaining. I do not believe you could tell from examination which wrist had been injured.

Two weeks before applying of treatment he had fallen on the hand. There was a marked silver fork deformity. There had not been a great deal of pain and he could use the hand quite well. The silver fork deformity characteristic of Colles' fracture in adults. In young people it is usually due to a backward separation of the lower radial epiphysis. Often carrying some fragments of diaphysis with it. Figure 186 the radiograph made at the time shows this latter to have been the condition. You observe that the displacement of the epiphysis was considerable. In view of this deformity and the fear that it would be more or less permanent with limitation of flexion we decided that an attempt to reduce the separation under anesthesia should be made in spite of the time that had elapsed since the injury occurred. This was done using a Thomas wrench a very powerful and useful instrument in factu work. There was however no improvement in position. You have seen the clinical result. Figure 187 is a recent x-ray. You observe that the epiphysis is back where it should be and that the evidence of the previous injury is slight.

M. K. is a case like R. R. She was thirteen years of age when she came to the clinic with a backward displacement of the lower

Not having had at the time we saw M. K. the benefit of knowing the late result on R. R. we attempted as we had in R. R.'s case a reduction under anesthesia on account of the deformity. It was likewise unsuccessful.

Figure 189 shows a radiograph made five months later. The correction is striking and as you see from examining her wrists the result is as satisfactory as if we had received this patient early enough originally to reduce the displacement.

These two patients have made me feel that one should not attempt extreme measures to get a satisfactory reduction on a separated lower radial epiphysis. I do not advocate a policy of non interference if it is possible to do a reduction because the principle of restoring normal relations as nearly as practicable in the treatment of fractures is correct but if a case comes late so reduction by manipulation is doubtful or impossible a good anatomic and functional end result may apparently be anticipated and certainly an open operative procedure would seem unwise.

In judging of epiphyseal separation the possibility of premature ossification with consequent shortening and deformity must be considered. Whether it is more likely to occur in unreduced partial separations such as these patients represent than when a good reduction has been accomplished I do not know. In the only patient I have had where premature ossification occurred at the lower radial epiphysis there was a fair reduction.

Another question of interest which this subject brings up is that of how soon nature will accomplish her anatomic restoration. M. K. is a five months result. R. R. you saw at the end of eighteen months but he was examined in nine and found to be all right.

Is the lesson of nature's corrective powers in displacement of the lower radial epiphysis equally applicable to other separated epiphyses? I have seen excellent results in similar cases at the upper humeral epiphysis not quite as perfect radiographically but leaving nothing to be desired practically. I have not had comparable cases of other epiphyseal separation.

examined but her mother was troubled by the deformity which became apparent as the swelling subsided and which was very

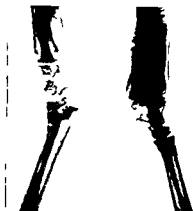


Fig 188—Separate film of left knee with backward displacement of femoral head. Anteroposterior view.



Fig 189—Same as Fig 188. Film of right leg.

noticeable. Incidentally you see from the scars on the patient's arm and from the radiograph that she had previously had an osteomyelitis of the ulna in that side.

If the fracture is not at one extremity or another of the bone coaptation splints are put on the arm. Finally an axillary pad is applied its width depending on the amount of abduction required.

Probably the ideal method of treating fractures of the humeral shaft particularly those with a tendency to displacement is suspension and traction with the patient in bed. Patients with such fractures however ordinarily cannot or will not stay in bed for three or four weeks. The method described above is an ambulatory application of traction its principal deficiency as compared with combined suspension and traction being in its lesser control of abduction and rotation of the lower fragment. It is fair to say however that the cases where conditions cannot be met satisfactorily with it are the exception and not the rule.

The advantages in brief are as follows. Traction obviates the necessity of a reduction in the majority of cases as the deformity is continued by spasm of muscles which is quickly overcome by the weight of the arm plus the weight applied. Furthermore the muscles thus made tense act as an encircling splint to the broken bone. By increasing or decreasing the weight and the amount of abduction the position if not satisfactory at first try can be corrected with little disturbance to the patient.

The avoidance of fixation at the shoulder and elbow mean an earlier return to normal function. You will note that the patients I am about to show have obtained early motion.

The patients are in my experience very comfortable.

Finally and this is an asset of any procedure in surgery the method is simple. It is quickly and easily applied and with the exception of the weight or shot bag only makes use of materials that are found in every office.

It is a principle in the treatment of fractures that the joints above and below the break should be immobilized. The suspension and traction treatment has demonstrated that this is not always necessary but it remains true when rigid splints are used. And it is just here that it seems to me the commonly used molded splints are likely to make trouble. They do not immobilize the shoulder sufficiently while fixing the elbow so

Truesdell has shown that nature can completely repair unreduced separated epiphyses occurring as the result of birth injuries

#### TREATMENT OF FRACTURES OF NECK AND SHAFT OF HUMERUS

The next 3 cases I have to show you illustrate a method of treatment of fractures of the neck and shaft of the humerus which is described in the standard treatises on fractures but has not received the attention or emphasis it merits



Fig 190—Traction dress for fracture of the humerus. A light is placed by the vertex of the head. The fracture is coapted by plaster. A triangular pad is placed on the axilla. The hand is placed in a sling. The pad may be easily made of paper and held in place by the hand.

This method employs the principle of traction and fixation of joints feature whose value the experience of the late war has conclusively demonstrated. Traction is obtained by hanging a weight of 1 or more pounds on the arm by means of adhesive straps as illustrated in Fig 190. The wrist (not forearm) is supported by a sling so that the forearm is carried at a right angle and the weight of the arm contributes to the traction.

Truesdell E. D. Birth Fractures and Epiphysal Dislocation. P. I. B. Hoebe. New York, 1917 pp 111-116.

been corrected and the muscular spasm overcome reduction is maintained for the period of rest. If there is any recurrence of deformity it is overcome again when the patient gets up. In one of the patients here (W. B.) radiographs were made in both erect and prone positions and the slipping in the latter was negligible.

Another theoretic disadvantage urged is danger of non union because of lack of immobilization. As you know the humerus



Fig 192—Same Fig 191 ft be g p p th t t w ght

is particularly liable to this unfortunate complication. The same argument was used against suspension and traction treatment of war fractures but experience did not bear it out. In my few cases union has been prompt.

The first patient of this series that I am going to show you W. B. aged ten years applied to the clinic the day after breaking his right humerus about the middle as the result of a fall. Figure 191 is a radiograph made at that time. Traction coaptation splints and an axillary pad were applied. Figures 192 and 193



that the broken ends instead of being immobilized are on the contrary moved on each other when the arm is moved. Another result is likely to be angulation. In one of these patients before us A. B. such an angulation (Fig. 199) shown in lateral x ray when she was in anterior and posterior molded splints was corrected by discarding the splints and applying traction. A plaster cast of trunk, arm and forearm will of course give



Fig. 191.—Fracture of humerus in position of the arm.

satisfactory immobilization and if the position obtained is good the result should be good. Such a plaster is time consuming to put on, cumbersome for the patient, and if the position obtained is not satisfactory its correction requires reapplication.

As a disadvantage of the ambulatory traction method it may be urged that traction is not continuous, ceasing when the patient lies down. This is true, and yet practical experience has shown that it is not productive of harm. After the position has

show the result. The weight was carried for two weeks. Figure 194 is a photograph made about one month after injury. At



Fig 195—F t t g l n k b f t t m nt



Fig 196—Sam Fig 195 ft h d t k pl ce

this time motion in the elbow and shoulder was about normal. It must be admitted of course that children regain function more rapidly than adults, yet this is a prompt return of function.



Fig 193—Same Figs 191 192 d 194 aft n.



Fig 194—Photograph of same patient Figs 191 193 both months

show the result. The weight was carried for two weeks. Figure 194 is a photograph made about one month after injury. At



Fig 195—F t t h l k b f t t m t



Fig 196—Sam Fig 195 ft h d t k n pl

this time motion in the elbow and shoulder was about normal. It must be admitted of course that children regain function more rapidly than adults yet this is a prompt return of function.



Fig 197—Sam Fgs 195 d 196 Photo graph made about six weeks after injury

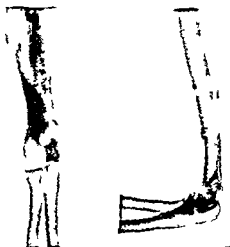


Fig 198—Mrs A B thirty years old. Fracture of left fibula and tibia

EN aged fifty five applied for treatment the day after falling and striking her left shoulder. There was a fracture at

the surgical neck with some displacement as shown in the radiograph (Fig 195) On examination the head moved with the shaft indicating an impacted fracture Traction was applied As her muscles were feeble the weight was discontinued at the end of five days the extremity alone serving as sufficient traction Figure 196 shows the result at the end of treatment Figure 197 is a photograph made about six weeks after the injury At this time it was noted that she could do ordinary things but



Fig 199—Sam Fig 198 shows the weight traction and plaster molded plaster splint applied to the arm before

that there was still some limitation of complete abduction at the shoulder

A B aged thirty fell down stairs breaking her left arm Figure 198 shows the fracture The displacement was not great She was tried with molded plaster splints and with Jones traction arm splint but neither were satisfactory the former especially causing angulation in lateral view (Fig 199) At the end of a week a weight was hung on with coaptation splints and a small



F g 200 —Sa Fgs. 198 and 199 E d lt f eatm t ft ght  
tracti



F g 01 —Sa Fgs 193-200 S perimposed ph ogr ph mad d f  
t m th

axillary pad The weight was maintained for ten days About five weeks after the injury it was noted that flexion of the elbow was nearly normal extension three fourths normal Figure 200 shows the end results radiographically Figure 201 is a super imposed photo raph made to show shoulder function eight weeks after injury Shortly after this she was discharged from the massage clinic as cured

It must be stated that as in other methods not all humeri treated by traction show ideal reductions radiographically Clinically however the results have been good And where the

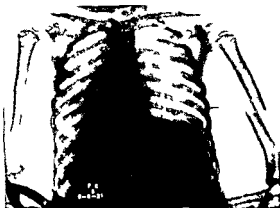


Fig 20 —F t f m d d l f h f t f h m Alth gh th  
b k d d t m t th g l l m t good d th  
h rt g

broken ends of the bone have not fitted in to ether perfectly as shown by x ray the general alinement of the arm has been straight thanks to the traction Figure 207 the radiograph of a patient during treatment illustrates the point Clinically his result was perfectly satisfactory You note that the bone is straight and without shortening although the broken ends do not mort se

To sum up briefly traction by the weight of the extremity plus one or more pound hung on the arm coaptation splints and an axillary pad are a method of treatment for fractures of



the humeral neck and shaft which is applicable in the majority of cases is simple provides a reduction without an operative procedure and maintains it and allows early return of joint function

### SKELETAL TRACTION IN FRACTURE OF FEMUR

The last patient I propose to show you B E aged eleven was admitted on July 18 1921 to St Luke's Hospital Two



Fig 203—B E aged 11 F of upper half of thigh the  
marked overriding

days previously he had fallen out of a tree and sustained a fracture of the left thigh at the junction of the upper and middle third. You see from the x ray (Fig 203) that there was marked overriding. As the shortening and deformity was pronounced it seemed to me unlikely that skin traction would be satisfactory and that the choice of treatment lay between open reduction and skeletal traction. The latter was chosen because it is efficient and simple and because the risks of an open operation seemed therefore unjustifiable.



Fig 204—Th sam

Fig 205 Anterior view of the foot and ankle



Fig 205—Th sam Fig 204 lateral view

Figure 204 and 205 show the result after a month of traction with suspension. Anteroposteriorly you note that the general line of the thigh is straight there is no shortening and callus is already visible although the fragments are not on end. Laterally the alignment is good. The tones were removed after fifty three days at which time union seemed firm. One week later the patient was up on crutches. When he was discharged from the hospital both legs measured the same.

Today over a year since injury he states that he can use his leg just as well as ever. You note that on inspection one could not tell which is the fractured thigh. Measurement re-



Fig 206 — Frontal view of left leg Fig 203 and 205 — Frontal view of right leg

reveals however that the injured extremity is one inch longer than its fellow. This stimulation to growth after fractured femur has been called attention to recently by Truesdell. The boy does not know of this disparity in length and it causes him no inconvenience. Figure 206 shows the present appearance of the femur.

I have shown you this case because it illustrates the value of skeletal traction in fractures of the femur and shows that childhood is not necessarily a contraindication to its employment as some have feared on account of danger to the epiphyseal line.

Truesdell, E. D. A. J. S. G. 74:493 1921

Of course care should be exercised in applying tons in children to insert well above the line. In general while the use of skeletal traction is well known and widely employed it seems to me that its applicability efficiency and simplicity are not wholly realized.



## CLINIC OF DR BYRON STOOKEY

NEW YORK NEUROLOGICAL INSTITUTE AND NEW YORK POST  
GRADUATE MEDICAL SCHOOL AND HOSPITAL

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### INSIDIOUS PARALYSIS OF THE INTRINSIC MUSCLES OF THE HAND AND ITS OPERATIVE RELIEF

INSIDIOUS paralysis of the intrinsic muscles of the hand may be the presenting symptom in a variety of lesions often obscure which differ in their pathology their anatomic level and in their mode of treatment. A certain number of these may be relieved by properly directed surgical measures. Atrophy and paralysis of the small muscles of the hand should direct attention to the last cervical and first thoracic segments of the spinal cord and the entire nerve path from these segments to their final peripheral distribution (F g 207). To determine the level of the lesion a thorough motor examination must be made of the individual action of each muscle of the arm forearm and hand and also a careful sensory study testing not only tactile pain and temperature but also vibratory and muscle joint sense. As a differential factor the sensory examination is perhaps most helpful distinguishing at once certain pathologic conditions which may be eliminated thus narrowing the field from which the differential diagnosis should be made. We shall thus divide insidious paralysis of the hand into two groups dependent upon the presence or absence of sensory change.

*A Insidious paralysis of the hand with no sensory changes—the efferent pathway alone involved*

- 1 Chronic poliomyelitis
- 2 Amyotrophic lateral sclerosis
- 3 Progressive muscular atrophy
- 4 Intradural spinal cord tumor involving the ventral root of eighth cervical and first thoracic segments

B *Insidious paralysis of the hand in which sensory changes are found—both efferent and afferent pathways involved*

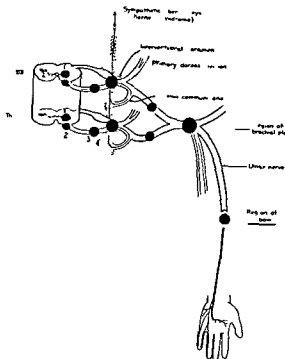


Fig 207—Schematic drawing of C. VIII and Th I segments depicting the pathways of sensory and motor fibers. The diagram shows the following pathways:

- 1 Syringomyelia
- 2 Intramedullary spinal cord tumor at eighth cervical and first thoracic segments

3 Intradural spinal cord tumor involving both ventral and dorsal roots of eighth cervical and first thoracic segments

4 Extradural and paravertebral tumors involving the eighth cervical and first thoracic nerve roots

5 Cervical ribs

6 Lesions about the elbow joint giving rise to pressure signs of the ulnar nerve at this level

7 Tumors of the ulnar nerve

8 Leprosy

**Case I**—Patient 2292 August 1922 G P aged forty one married Italian occupation soda water bottler

*Complaint*—Weakness in left hand shriveling up of left hand dull ache of left hand

*Character of First Symptom*—Weakness of left hand

*Date of First Symptom*—October 1920

*Progress*—Worse no remissions

*History*—During the past eighteen months patient has gradually lost the power of his left hand He first noticed this after working part of the day When he went to work in the morning his hand did not feel noticeably weak but did so after a few hours work when he would have to stop in order to rest his hand Gradually his hand became so weak that he has been unable to follow his occupation About ten months ago that is eight months after the onset he noticed a dull pain in the region of his shoulder which was constant and radiated somewhat to the front of his chest. This pain is not present at this time but now the patient complains of pain on the inner surface of the arm and hand His hand falls asleep very readily and there is a burning sensation in it which is intermittent in character

*Injuries and Diseases*—Patient has had no injuries and has never been ill He admits syphilis twenty years ago and gonorrhea at the same time He has had no clinical manifestations from his infection twenty years ago nor has he had any treatments up to the present time

*Habits and General Physiologic Status*—Tea and coffee moder



ately tobacco moderately occasionally beer sexual life is normal sleeps well his appetite is good he has had no trouble with his urination

*Family History* —Four children and no miscarriages wife is healthy and well

*Physical Examination* —*Voluntary Motor System* —No abnormal attitudes and deformities except the atrophy of the left hand and along the inner surface of the left forearm

*Gait* —Normal in all its phases walking on toes and heels and on a line is well performed

*Coordination* —*Equilibratory* Standing with feet together both with eyes open and closed normal *Non equilibratory* Finger to finger toe to object above recumbent heel to-knee along shin are all normal

There is no adiadokokineis

Skilled acts are normally performed in the right hand the left hand cannot be tested because of weakness

*Abnormal Involuntary Movements* —A slight tremor fine and irregular in both the right and left hands is present No fibrillary twitchings seen

*Reflexes* —*Deep*

	Left	Right
P t l	0	+
B p	+	+
T p	0	+
R d l	+	+
U l	0	0
P t ll	+	+
H mstr g	+	+
A h ll	+	+
N kl l		

*Superficial*

Abdominals barely present

Cremasterics present

No Babinski or any of its modification

*Muscle Strength* —Normal throughout with the exception of the left hand which shows marked weakness in both flexion and extension with marked atrophy of the intrinsic muscles

*Electrical examination* —No shock reaction of degeneration of the

hypothenar group interossei and deep muscles of the thenar eminence marked wasting of the interosseous spaces the first being particularly noticeable

There are no abnormal associated movements

*Laboratory Examination*—Blood spinal fluid and urine were normal Wassermann in both blood and spinal fluid negative

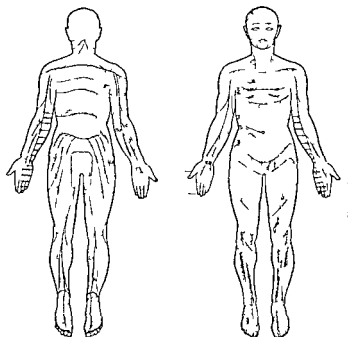


Fig 208—Ch t C I t h w f t l All f m f t  
se b l t y l d h w i g m a k i g

*General Sensory Examination*—Shows sensation to be normal throughout normal to touch localization and discrimination as well as to pain and temperature with the exception of the left hand and inner surface of the left forearm (Fig 208)

Vibratory is not disturbed except in the distal two phalanges of the fifth finger

Mucle joint ense is unimpaired

*Nerves*—Olfactory nerve is normal Vision and fundi show no changes The pupils The right is greater than the left. The position is central and their shape irregular Hippus is absent Reaction to light and convergence is normal No Argyll Robertson pupil The palpebral fissures are unequal the right being greater than the left. Horner's syndrome present on the left. The left side of the face does not sweat

The remaining cranial nerves show no abnormality

*General Systemic Examination*—No pathologic conditions noted Heart lungs and abdomen show no abnormality

The presenting symptom in this man is an insidious paralysis of the intrinsic muscles of the left hand The motor examination

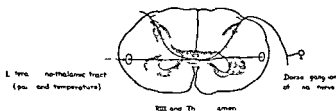


Fig. 209—Schematic drawing of cross-section of spinal cord showing degeneration of pain and temperature fibers in the central gray. A lesion of the dorsal root ganglion of the 8th nerve causes sensory deficit in the hand and forearm and in the lower extremities.

shows a paralysis of the intrinsic muscle of the hand with retention of degeneration and also a weakness of the flexors along the inner border of the forearm. No other motor weakness is made out. However the routine sensory examination revealed sensory changes extending up the forearm and on to the inner surface of the arm as far as the base of the axilla.

The cutaneous areas thus involved point to the dermatomes of the eighth cervical and first thoracic nerves. As will be seen from the chart all modalities of superficial sensation are equally implicated including tactile pain and temperature. No other areas of changed cutaneous sensibility are to be found.

If this were a lesion due to syringomyelia we would expect to

find a dissociation of sensation in which pain and temperature would be lost with tactile acuity retained due to the fact that the pathologic changes in syringomyelia are in the central gray of the spinal cord where pain and temperature fibers cross (Fig. 209). Thus in syringomyelia the fibers carrying these types of sensation are involved while tactile and the other forms of sensibility usually escape or are but slightly involved. Furthermore if this were syringomyelia one would expect to find loss of pain and temperature in both hands since the fibers from both sides would be involved as they decussate in the central gray. While this may not be the only differential point it is perhaps the most important and will suffice to enable us to rule out syringomyelia in this patient. The same reasoning may also be applied to rule out an intramedullary spinal cord tumor involving these spinal segments since in an intramedullary spinal cord tumor one would expect also to find a dissociation of sensation in which pain and temperature would be more involved than tactile. In intramedullary disease the greatest sensory disturbances are at and immediately below the level of the lesion while the more distal cutaneous areas are less involved.

Sensory changes such as we find here cannot be due to a lesion of the ulnar nerve alone since areas of anesthesia are found which are not under the domain of this nerve. Neither do the areas involved correspond to any single cutaneous nerve but rather they are segmental that is corresponding to root and not peripheral nerve distribution. Consequently we must look for the lesion in this patient in some part of the nerve path where the eighth cervical and first thoracic roots may be involved. This may be anywhere from the origin of the ventral and dorsal roots within the dura to their formation and differentiation into the secondary cords of the brachial plexus or the nerves which arise from them namely the inner head of the median the ulnar and the lesser internal cutaneous.

If the lesion were a tumor involving the eighth cervical and first thoracic nerve roots within the dura we could account for the sensory and motor changes found. Such a lesion would in fact explain everything present in this patient. But a tumor

sufficiently large to involve both of these roots would certainly cause some pressure on the spinal cord and we would have in addition to the motor and sensory changes here presented signs referable to the conduction paths of the spinal cord especially those of the pyramidal system giving rise to altered pathological reflexes such as ankle clonus Babinski or its modifications. Sensory changes also would probably be found in the lower extremities and the trunk since in extramedullary intradural



Fig 210—Ry first patient with partial transverse myelitis (C VIII to Th I) right brain (Posterior) used postgraduate first through second plate in hospital (personal)

tumors sensory changes are usually greatest in the more peripheral segments. None of these signs are present in the patient and in the absence of such signs intradural spinal cord tumor must be considered as most improbable if not excluded altogether.

We have thus proved the location of the lesion so that it must lie somewhere between the dura and the formation of the inner secondary cord of the brachial plexus. There are no somatic motor nerves arising from the eighth cervical and first thoracic

nerve roots in this region which by paralysis might serve to localize the exact level of this lesion with greater precision. However a very important group of symptoms may be found in lesions of the eighth cervical and first thoracic roots. If the symptoms are present the lesion is very close to the intervertebral foramina of exit of these nerves and certainly central to the point at which the sympathetic rami communicans arise (Fig 207). If the eighth cervical and first thoracic roots are



Fig 211 — Ray (same patient) showing the lesion

involved before the origin of sympathetic rami communicans is given off the pupillary sympathetic fibers which pass out in these nerve roots to join the inferior cervical sympathetic ganglion would be implicated and give rise to a classical syndrome the syndrome of Horner which is characterized by inequality of the pupil that of the affected side being the smaller that is anisocoria and myosis by narrowing of the palpebral fissure sinking in of the eyeball that is enophthalmos and

a unilateral flushin of the face with loss of sweating on that side

In this patient anisocoria miosis narrowing of the palpebral fissure enophthalmos with loss of sweating on that side of the

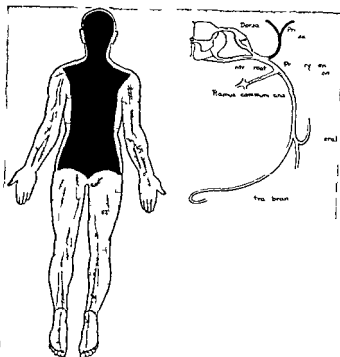


Fig 212—Fig t h w f h ppl d by th p m ry d rsal  
divi s—sh d d an l d d bet ee pa o- mso-t och t  
sch al kn Th ma d f th tru k and both th ppe d l  
t mt rvat d by th p mary e tral d I sert h  
typ cal p l ry w th p mary d rsal d bl k corr po d th  
e tru k h h th y pplj—prim ry e tral d h d d

face are all present thus since the cervical sympathetic fibres are involved we are enabled to locate the lesion close to the intervertebral foramina of exit through which the eighth cervical and first thoracic roots pass The most probable nature of lesion in this region giving rise to slowly progressive paralysis

is a paravertebral tumor. This is the only conclusion which can be reached from the anatomic findings. Palpation in the cervical region suggests confirmation of the diagnosis but palpation of this region is most unsatisfactory and palpation alone is not sufficiently reliable.

X-ray examination has been made and shows a mass on the left side of the vertebral column which undoubtedly involves the eighth cervical and first thoracic nerve roots thus giving rise to the slowly progressive paralysis with atrophy of the intrinsic muscles of the hand (Figs 210 and 211). This patient was first seen very early in his illness at which time no tumor was found and it was thought that he had signs possibly referable to a cervical rib. The X-ray revealed a small cervical rib which in itself was not enough to account for his signs. However it must be borne in mind that an X-ray showing only a short cervical rib does not necessarily rule out the presence of a cervical rib which might give rise to signs since the rib may be continued forward as a dense fibrous band. Of course such a band does not show in the X-ray and consequently the X-ray alone cannot rule out the presence of cervical rib pathology. I have never seen Horner's syndrome due to a cervical rib.

Exploratory operation was advised but refused. The patient then left the Neurological Institute where he was under observation and appeared at the Post Graduate Hospital. At this time the diagnosis of paravertebral tumor was definitely made. Operation was again advised and again the patient refused. The patient has returned again to the Neurological Institute to have anything done for him saying that he had refused operations before because an outside physician a compatriot who attended him during visiting hours unbeknown to the house staff advised him against any operative procedure. Unfortunately at the present time operation would be inadvisable and X-ray therapy or radium will be recommended.

**Case II**—Date March 1921. Occupation broker. Nationality American. Single. Age thirty-eight.  
*Complaint*—Weakness of left hand.



*Character of First Symptom*—Weakness of left hand

*Date of First Symptom*—Not definitely known though to be about 1918-1919

*Onset*—Gradual and progressive No remissions

While overseas serving as an officer in the American Army during which time his duties were very much more active than they had ever been before he noticed that weakness of his left hand gradually came on and that at night while asleep there would be a numbness and tingling sensation in the left hand. This tingling sensation also came on during the daytime on resting his arm on the table and in numerous other positions. Except for the weakness and numbness the patient has felt perfectly well has lost no weight has had no nocturnal headaches and no disability in his gait there have been no other paresthesias.

*Past History*—Entirely negative. He has never been drunk never unconscious nor has he had any injuries except when six years old he broke his left arm.

*Habits and General Physiologic Status*—Entirely negative. His family history is unimportant.

*Physical Examination*—*Voluntary Motor System*—No abnormalities except the weakness of the left hand.

*Gait*—On toes heels and on a line all normally performed. Fournier's test are negative.

*Coordination*—*Equilibratory*—Standing with feet together eyes open and closed and on either foot normal performed.

*Non-equilibratory*—Finger to-nose finger to-finger toe to-object above ecumbent heel to knee along shin are all normal.

No adiadokokinesis no dysmetria.

Skilled acts are normally performed.

There are no abnormal involuntary movements and no tremors are noted.

*Deep Reflexes*—Upper and lower extensor show no alterations from normal.

*Superficial Reflexes*—All normal. There is no Babinski or any of its modifications.

*Muscle Strength*—No motor weakness made out except in the left hand.

Examination of individual muscular action shows that the muscles paralyzed are the interossei the flexor pollicis brevis (interosseus primus volaris) and the abductor pollicis transversus and obliquus and those of the hypothenar group

In the forearm the flexor carpi ulnaris shows only slight weakness but no apparent weakness could be made out in any of the remaining muscles of the forearm The musculature of the shoulder girdle is normal and no focal weakness or changes in electric reactions could be made out except that the electric examination of the intrinsic muscles of the left hand shows polar

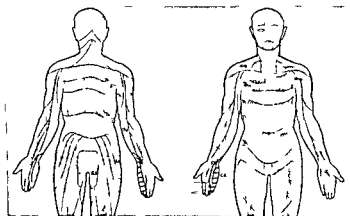


Fig 213—Ch rt Case II t h w ea f th d t b t f th  
lna rv All th t mal

equality that is  $ACC = CCC$  Reaction of degeneration is not present

There are no abnormal associated movements

*General sensory examination* is negative throughout with the exception of the left hand (Fig 213)

*Cerebral reflexes* are all normal

*Genital system examination* normal

*Laboratory Examination*—Blood examination including Wassermann negative urine negative

The presenting symptom in this patient as in the first is an

insidious paralysis with atrophy in the intrinsic muscles of the hand

Let us now interpret the results of the motor examination. First the lesion must be somewhere in the lower motor neuron either in the ventral horn cells or along some part of the peripheral path of their axones since atrophy and changes in the electric reactions are present.

If the injury were supranuclear that is above the ventral motor cells atrophy and electric changes would not be found. If the pyramidal tracts were involved paralysis would be present without atrophy and without changes in the electric reactions. Paralysis of this type is called upper motor neuron paralysis and is characterized by normal electric reactions and spasticity with increase of the reflexes while when the lower motor neuron is involved electric reactions are altered showing either polar equality or if the stage is further advanced reaction of degeneration atrophy is present and in place of spasticity with increased reflexes atony is found with diminished or abolished reflexes. If a chronic process in the ventral horn cells were responsible for the paralysis and atrophy we would expect to find fibrillary twitchings in the muscles but these are not present. However fibrillary twitchings are not always indicative of chronic intramedullary disease of the ventral horn cells. They may be found in the tongue musculature after section of the hypoglossal nerve in paramyoclonus multiplex and in extramedullary spinal cord tumor which lie ventral to the spinal cord. In experimental work fibrillary twitchings are seen in any muscle which is cut off from its nerve supply.

The spinal segments responsible for the involved muscles in this patient are the eighth cervical and first thoracic but all muscles supplied by these two segments are not implicated. Nor can we attribute the paralysis to either the eighth cervical alone or first thoracic alone since the paralysis is greater than the distribution of either of these segments. In short the muscular involvement is not purely segmental. It does not correspond in its distribution to either one of these segments or to both of them combined.

If the lesion is not segmental neither can it be considered radicular that is involving the nerve roots prior to their formation of the peripheral nerves which arise from the plexus since the muscular distribution of the nerve root is also segmental Horner's syndrome is not present consequently the lesion must be distal to the intervertebral foramen Thus from the motor examination the lesion must be at or distal to the formation of the peripheral nerve trunks arising from the inner cord of the brachial plexus

We shall now turn to the sensory examination We find that the sensation is normal along the inner border of the arm and in the axilla—areas supplied by the eighth cervical and first thoracic segments and also by the internal and lesser internal cutaneous nerves We may thus safely rule out from the sensory examination that the lesion is segmental thus confirming the conclusion reached as a result of the motor examination However there is still another test which may be done before such a conclusion is wholly justified It will be recalled that immediately after the formation of a mixed spinal nerve each divides into two primary divisions—a ventral primary division and a dorsal primary division The ventral primary division enters into the formation of the limb plexus in the lower cervical and lumbosacral regions while in the upper cervical and thoracic regions these divisions supply the lateral and ventral trunkal musculature and the overlying skin The primary dorsal divisions *never* enter into the formation of the limb bud and *never* supply lateral or ventral musculature but supply the dorsal axial musculature and the overlying skin The area of cutaneous sensation supplied by the dorsal primary divisions is therefore restricted to the head and trunk and is limited laterally by two curved lines drawn from the following points beginning at the midparietal region of the cranial vault they extend laterally on either side to the mastoid acromion trochanter and ischium and are commonly called the parieto-mastoid acromion trochanteric ischial lines (Fig. 212) This area of skin innervation is of great value as a means of more precise localization If sensory changes are included within this area the



1



2



3

Fig 214—Ph gr ph li h a type f th see  
 lna r paral ses Th l h l ss t t ool th  
 ea loss t p po d th larg rcl d ca l ss m degree  
 f mperat re N 1 N t th d ol d h d rs m f h  
 h d d lso th vt f h th ia h po taxal bo d f h  
 f m N 2 h m re typ l d trib f l hes ex  
 t d g h d rs m f h h d t h lat l d f h f rth m ta  
 ca pal bo Th h m h f f ld f h wrist  
 N 3 A zo f l red se pa h ia h t h r l ded  
 w th th a y l

le ion mu t be at o centr l t the point at v hich the spinal nerves  
 divide into dorsal primary di on and ent l primary d vi  
 sions

There are certain variations in the distribution of some of the spinal nerves which are worthy of note the first cervical nerve has no cutaneous representation the seventh and eighth cervical and the fourth and fifth lumbar also have no cutaneous representation on the dorsal surface of the trunk due probably to the fact that these dermatomes are to a great extent absorbed in the formation of the lumb plexuses Thus in this patient examination of the skin on the dorsal surface of the trunk could reveal at the most a loss in the area in that region on the dorsum supplied by the dorsal primary division of the first thoracic However practically it is almost impossible to detect a cutaneous sensory loss when only one segment is involved In this patient we have examined the area supplied by the dorsal primary division of the first thoracic segment and are not surprised or influenced by the fact that no sensory changes have been detected

The sensory examination however shows a typical loss of sensation of pain temperature and tactile corresponding to the area supplied by the ulnar nerve (see Fig. 213) The motor examination also shows paralysis corresponding to the muscular distribution of the ulnar nerve except that while complete paralysis and atrophy of the intrinsic muscles of the hand are present only weakness of the flexor carpi ulnaris is found with no appreciable change in the flexor profundus digitorum

It may seem unnecessary to examine as extensively as we have done but unless a complete examination is made errors in diagnosis are inevitable

Since the examination shows a lesion of the ulnar nerve to be present it remains for us to determine at what particular point in its course the nerve is implicated and what is the nature of the process There is no trauma of which the patient is aware except as you will recall that when six years of age he broke his arm but he has not complained of his fracture since The arm does not bother him at this time nor has he ever noticed any disability other than a slight limitation in flexion and extension However examination of the elbow shows a marked angulation and prominence of the medial epicondyle behind which the ulnar nerve passes (Fig. 215) Palpation of the nerve throughout its

course shows no nodular enlargement and no thickening except possibly at the ulnar groove behind the medial epicondyle. By careful palpation a tumor of the ulnar nerve which runs a rather superficial course can be detected but not always. We can only say that no tumor in the course of the ulnar nerve is palpable.



Fig. 215.—X Ray of second patient with growth of soft tissue behind elbow joint.

Leprosy though extremely rare in this country may also cause thickening and tumor like enlargement of a peripheral nerve. Of the peripheral nerves involved in leprosy the ulnar is the most frequent. Leprosy of the ulnar nerve may give rise to slow progressive paralysis with sensory changes. The sensory changes however make possible the diagnosis for the skin is

usually thickened and rough appearing quite different from skin changes seen in any other nerve condition. If the history is gone into it is usually found that the patient has been in areas in which leprosy is endemic.

Cervical rib may also be considered but pain is usually the more predominant symptom and with a lesion at this level with such advanced paralysis of the intrinsic musculature of the hand paralysis and atrophy of the flexor carpi ulnaris and flexor profundus digitorum would be expected. As we have already indicated above the absence of the cervical rib by x-ray unfortunately does not preclude the presence of a fibrous band which may continue forward from even a very rudimentary cervical rib process around to the first rib or to the manubrium and cause nerve pressure as effectively as a true bony cervical rib.

We know that an old fracture of the elbow with angulation may cause ulnar nerve signs many years after the injury—in another patient I have seen the first symptoms come on thirty one years after the fracture. Apparently a fracture of the elbow may cause a low grade trauma to the ulnar nerve in this region which may require many years to make itself felt. Frequently the onset of symptoms may be traced to new activities on the part of the patient in which the movements of the arm are greatly increased. Tingling is a frequent sign though not always present. But angulation and fractures are not the only causes about the elbow which may give rise to ulnar symptoms. In some individuals the ulnar groove is poorly defined and shallow so that subluxation of the ulnar nerve takes place in movements of the arm. Ham-Cohen and others have found that subluxation of the nerve is not uncommon in an apparently normal elbow joint.

A bursa is found beneath the ulnar nerve in the ulnar groove and in one patient with ulnar nerve signs a telephone operator a *chronic inflamed bursa* was found at operation lying beneath the ulnar nerve within the ulnar groove. The diagnosis of bursa was not made until operation the preoperative diagnosis being a tumor of the ulnar nerve. In several patients I have seen insidious paralysis of the hand due to a continued



course shows no nodular enlargement and no thickening except possibly at the ulnar groove behind the medial epicondyle. By careful palpation a tumor of the ulnar nerve which runs a rather superficial course can be detected but not always. We can only say that no tumor in the course of the ulnar nerve is palpable.



Fig. 215—X-ray of the elbow joint showing a large, dark, irregular mass on the lateral aspect of the elbow, likely representing a tumor or significant swelling of the ulnar nerve or surrounding soft tissue.

Leprosy though extremely rare in this country may also cause thickening and tumor like enlargement of a peripheral nerve. Of the peripheral nerves involved in leprosy the ulnar is the most frequent. Leprosy of the ulnar nerve may give rise to slow progressive paralysis with sensory changes. The sensory changes however make possible the diagnosis for the skin is

to it a soft bed instead of a bony one. The dorsal part of the elbow is peculiarly exposed to trauma and a nerve lying in a bony bed does not have the buffer protection which soft tissues

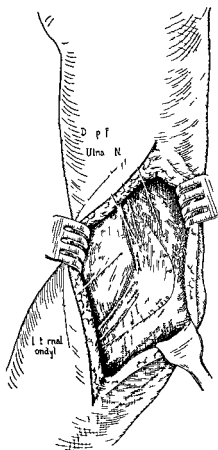


Fig 216—The dorsal aspect of the elbow joint showing the position of the ulnar nerve. (From Stook y S gical d Mech cal Treatm t f P nph ral N rve )

afford. Furthermore the constant movement of flexion and extension places the nerve under a certain degree of tension particularly during flexion.

habit of sleeping with the arm acutely flexed with the hand beneath the pillow producing paralysis in the ulnar musculature much the same as paralysis of the extensors of the wrist may be caused by sleeping with the arm in abduction—Saturday night paralysis

**Anatomy of the Ulnar Nerve at the Elbow**—Above the medial epicondyle the dorsal surface of the humerus shows a slightly channeled groove the medial ridge of which leads into the ulnar groove. The ulnar nerve passes through this groove to reach the volar part of the forearm. Occasionally the medial ridge of this groove is increased in size as if to transform the groove through which the nerve passes into a bony canal. *Such a bony canal for the ulnar nerve is found in some of the lower mammals.* The periosteum of the ulnar groove is thickened and glistening and is overlaid by fibers of the internal lateral ligament of the elbow joint. By the attachment of the brachial aponeurosis to the medial epicondyle and olecranon the ulnar groove is transformed into an osteofibrous canal. This aponeurosis is enforced by transverse fibers frequently quite dense extending from the region of the epicondyle on to the olecranon and representing a remnant of the old epitrochleo-anconus muscle of some of the lower mammal and occasionally present in man. The nerve is surrounded by loose connective tissue and separated from the floor of the groove by a bursa. Running with the nerve will be found the dorsal ulnar collateral artery which may cause very troublesome bleeding.

**Surgical Treatment**—Various methods of treatment have been advocated for the relief of pressure of the ulnar nerve due to increased angulation of the medial epicondyle.

1 Simple liberation of the ulnar nerve in the groove with autotransplantation

2 Deepening of the ulnar groove

3 Supracapillary osteotomy of the humerus

4 Transposition of the ulnar nerve to the dorsal surface

Any procedure which does not transpose the nerve is inefficient. *Transposition is the procedure of choice.* It places the nerve in a position in which it is not exposed to trauma and gives

(2) In the region of the elbow the branch to the flexor carpi ulnaris comes off and is endangered by transposition but can usually be saved though not always by careful intraneural dissection freeing the branch well up within the nerve trunk. If the branch is injured reinnervation of the flexor carpi ulnaris can be obtained by direct implantation of the branch into the flexor carpi ulnaris muscle at a different level or if the branch is destroyed at its origin from the nerve trunk an artificial nerve branch may be formed and likewise implanted.



Fig 218—Photograph showing elbow disoperative scar second patient

In order to hold the nerve in place in its ventral position two procedures are available

(1) To resect a flap of the deep fascia and suture it over the nerve as shown in Figs 216-217

(2) When the incision is made it should be carried through the skin and superficial fascia down to the deep fascia and then peeled back by sharp dissection from the deep fascia so as to

Even in the presence of a normal elbow it has been found that suture of the ulnar nerve with the line of suture in the region of the ulnar groove is less successful than if the nerve be transposed and sutured in front of the medial epicondyle. If carefully performed transposition can be done without impairment of conductivity of the ulnar nerve.

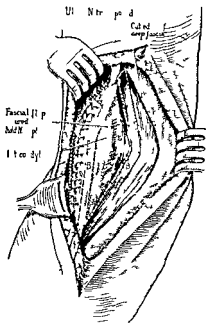


Fig 217—Ulnar nerve transposed from its old position behind the medial epicondyle to its new position in front of the medial epicondyle (From Stookey, Surgical and Medical Treatment of Peripheral Nerves).

**Technic**—In transposition two points of importance should be mentioned.

(1) Avoid any sharp angulation of the nerve either above at the beginning of its new course anteriorly or below where it enters the flexor carpi ulnaris muscle. Kinking and angulation must be prevented and is best done by extensive exposure giving to the nerve a very gradual course forward.

## CLINIC OF DR. C. J. MACGUIRE, JR.

### BELLEVUE HOSPITAL

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### THREE SURGICAL PROBLEMS

Case I Sarcoma of Tibia

Case II Traumatic Hemorrhagic Nephritis

Case III Actinomycosis of Appendix

GENTLEMEN this morning I am going to discuss with you 3 very dissimilar cases but all presenting unusual difficulties in diagnosis and treatment

#### CASE I

The first case Frances Z. a female aged forty two native of Austria was admitted to Bellevue Hospital on December 1 1919 with the following history

Twelve years ago patient fell down a flight of stairs and was disabled for about three months having to use a cane continuously in walking. Eleven years ago patient fell again on right knee with resultant pain tenderness and swelling for one month. Eight years ago patient noticed a lump about 1 inch in diameter on inner side of knee which was painful to touch. Six months later another lump formed on the opposite side of the knee. These two lumps grew very little until four years ago when they slowly increased to the present size. For the past eight weeks she has been having burning pain over the lump. One week ago she noticed that veins over lump were very prominent at times more than at others. For the past eight weeks she has had difficulty in bending knee and difficulty in walking. She has always been strong and healthy except for the present trouble.

Physical Examination—There were no abnormalities or evidence of disease except in the local condition which was as

undermine freely the anterior flap. The nerve may then be held in its ventral position by roughening the superficial and deep fascia *along the line to be sutured* and suture it where roughened leaving sufficient space unroughened to form a smooth natural canal between the superficial and deep fascia through which the nerve may glide readily.

Either method will be found satisfactory, the latter being the simpler and quite sufficient may be preferred. This procedure was used in this patient.



Fig. 219.—Photograph showing hand and forearm half a year after operation. Interosseous nerve intact though some atrophy still present.

*Postoperative Report*—One and a half years after the operation patient shows beginning return of function in the hypothenar group of muscles and also in the interosseus that of the first space showing apparently more regeneration than the others. The electric reactions are now normal and the sensory examination shows only a slight impairment of cutaneous sensibility to tactile pain and temperature in the fifth finger the rest of the hand having regained sensation.

capsule and showing by x ray the trabeculated appearance so typical of what we call giant cell sarcoma of the bone. These tumors according to Bloodgood are benign never metastasize although they may recur locally and the treatment is curettage of the bony cavity chemical cauterization and such other measures as may be necessary to guarantee a weight bearing limb



Fig 221—x Ray fth t m t k b f s t per to

Therefore on December 10 1919 I made an incision over the outer surface of this mass and found that the bony capsule at this site had ruptured and that the head of the tibia was the site of a large cavity divided into smaller cavities by trabeculae of cortical bone and bounded internally only by a very thin shell



follows. Over the anterior and both lateral aspects of the head of the right tibia there was a very large mass continuous with the tibia and bony hard except over the outer aspect. Here firm pressure caused a crunching as of a bony shell. The head of the fibula seemed involved in this mass. Near the center there was fluctuation and increased heat. The superficial veins were markedly distended. The Wassermann was negative. The



Fig. 220—Appearance of mass

accompanying photograph (Fig. 220) shows the size of the process while the reproduction of the x-ray plate (Fig. 221) gives some idea of the bony changes. The x-ray department reported the plate as that of a giant cell tumor of the tibia. The indications now seemed simple. Here was a slowly growing tumor of the bone of ten years standing showing no tendency to form metastases located at the head of the tibia having a bony

almost entirely of spindle shape and in these areas the number of giant cells are relatively few. These cells lie on the surface of a rather dense mass of connective tissue. The tumor appears to be limited by this connective tissue as the latter is only infiltrated for a short distance. Sections taken from the capsule which has broken through the bone shows the tumor tissue here to be made up entirely of spindle cells. These cells resemble very closely those seen in a fibrosarcoma.

**Diagnosis**—Sarcoma of mixed spindle and giant cells (myeloid sarcoma)

This was not a clear cut picture of what is loosely called giant cell sarcoma. In speaking of this tumor as in practically all bone sarcomata we are handicapped by the lack of a standardized nomenclature. It is evidenced by the various names given to this condition e. g. myeloma, epulis type of tumor, osteosarcoma, bone cyst, etc. The large spindle cell element was alarming and caused us to subject a specimen to the judgment of other pathologists. These men all agreed that the picture was not typical but that the proper procedure had been followed.

When the sutures were removed we found that the fat transplant had broken down with consequent suppuration. Accordingly the flap was lifted back and the cavity dakinized with Carrel tubes. This resulted in healthy granulations and about two and one half months later we were contemplating some type of operation to obliterate the dead space when we discovered a rapidly growing, red mass in the heart of the cavity and two nodules in the skin over the patella. These grew with astonishing rapidity, rapidly filling up the cavity. A section was taken and sent to the pathologist who reported a histologic picture markedly different from that of the original tumor. This recurrence was made up almost entirely of spindle shaped connective tissue cells and many scattered spicules of recently developed bone.

The appearance of nodules in the soft parts combined with this rather alarming pathologic report seemed to indicate the advisability of amputation and on March 16 1920 the limb was

of bone The contents of this cavity consisted of old blood clot jelly like granulations and large areas of soft yellow fibrous tissue The cavity connected directly with the medullary cavity of the tibia This space was thoroughly curetted out leaving superiorly only the articular cartilage as a roof externally only the fibula and internally a thin shell of bone to support the weight of the body Bleeding from the bone was controlled with great difficulty A mass of subcutaneous fat was now removed from the anterior abdominal wall and dropped into the dead space in the head of the tibia The anterior thin shell of bone was divided transversely with bone cutting forceps and the two flaps broken back to help obliterate the cavity

At this point our problem seemed mainly one of mechanics It seemed doubtful that weight bearing could ever be possible without the danger of a pathologic fracture The pathologic report however complicated the picture

**Macroscopic Examination**—Specimen consists of a large number of pieces of tissue some of which are pieces of bone others are mostly blood clot while still others consist of what appears to be tumor or connective tissue The pieces of bone have a ragged appearance and in places are covered with and seem to be infiltrated by a mass of tumor tissue The tissue which seems to consist of blood clot has a reddish color is very soft and has many areas in it which are somewhat the appearance of a part of a capsule or cyst wall to which is attached a rather soft reddish mass which is probably tumor tissue

**Microscopic Examination**—Sections taken from what appears to be blood clot shows a rather cellular mass of connective tissue hemorrhage and tumor-cell The tumor cell in this vicinity consist of giant cells many of which are very large and contain as many as 15 or 20 nuclei The cells are profusely scattered throughout this area The other cells are rounded and close to the connective tissue they are of spindle shape Near the junction of the tumor with the connective tissue there is a rim of newly developed bone This bone contains a large amount of calcium salts as seen from the purple stain Sections taken from the dense tissue show the tumor cells to be

prognosis affected by rupture of the bony capsule and infiltration of the soft parts. He also states that recurrences may occur locally but should be treated by curettage. Here however we have a tumor in which rupture of the capsule and curettage had in some way caused the lighting up of an element previously dormant. This new element showed none of the histologic characteristics of giant cell sarcoma or epulis type of tumor and its rapid growth at some considerable distance from the original tumor seemed a marked indication of malignancy.

Dr McWhorter who examined these sections was particularly struck by the formation of bone in the metastases in the soft parts. Although he did not attach great clinical significance to this element it showed he thought how artificial is the classification of bone tumors into osteogenic and osteogenic types. This tumor apparently originally osteogenic became osteogenetic.

Since the last operation almost three years ago the patient made an uneventful convalescence is walking around on an artificial limb and as yet shows no evidence of metastasis (x rays of lungs being negative) but one cannot feel safe until the five year period has passed. There is no doubt as to the permanent cure produced by following Bloodgood's method in treating the usual sarcomata of the epulis type but this case I believe indicates the existence of another type clinically indistinguishable which has not yet been classified and in which it would be very dangerous to follow any dictactic rules.

Sarcomata of the bone other than those of the epulis type are associated with early metastases to the lung in the majority of cases irrespective of amputation. However we do not feel that the possibility of a small intermediate class has been ruled out and fear that indiscriminate curettage may lead to bad results in cases whose only hope lies in amputation.

This case has been distinguished not only by the difficulty in determining the proper surgical procedure but also by difficulty in finding the proper pathologic classification. In collaboration with our pathologist Dr John E. McWhorter we have made an analysis of cases of sarcoma of the long bones on

removed at the junction of the lower and middle third of the femur

Careful examination of the amputated limb (Fig. 222) showed the probable wisdom of this decision. Sections taken from the soft parts and the secondary nodules showed a mass of cells of



Fig. 222—Sagittal section of amputated limb. Dark mass cavity in head of tibia and small mass just below patella. Soft part presents recurrent tumor tissue.

the spindle type densely packed together and infiltrating the surrounding tissue with newly developed bone irregularly distributed throughout. Sections taken from the bone cavity show the typical arrangement that is associated with the giant cell sarcoma of the medullary type. According to Bloodgood there is no danger of metastasis in a giant-cell tumor nor is the

7800 polymorphonuclears 77 per cent Temperature was 99 F pulse 116 and respirations 24 Urine was dark amber reaction acid specific gravity 1022 albumin a trace guaiac positive leukocytes a few and many red blood cells

Physical examination showed the patient appearing anemic with a recent loss of blood otherwise well nourished and healthy There was moderate rigidity on the right side of the abdomen but no mass or induration The rest of the physical examination was entirely negative

At this point the striking features of the case have been the interval of ten days between the trauma on the right side the onset of hematuria the periodic cessation and recurrence of the attacks even though the patient had been confined to bed from the onset of the hematuria and the enormous clots passed per urethram In view of the absence of frank blood in the urine on admission and the apparent subsidence of the process absolute rest in bed seemed the only indication Twenty four hours later without apparent cause pure blood accompanied by large clots were again passed This was associated with marked aggravation of the patient's anemia so that we felt that a further loss of blood would jeopardize her life Constitutional causes for the bleeding seemed to have been eliminated The coagulation time was normal and there was no history of any hemophilic tendency

Dr E L Keyes Jr was consulted and performed a cystoscopy The bladder was found clear with the exception of a blood clot protruding from and apparently plugging the right urethral orifice The left ureter admitted a catheter and was apparently functioning normally At this point an exposure of the right kidney was determined upon

The usual lumbar incision was made and upon exposure of the right kidney there was found no evidence of rupture of the kidney capsule and no evidence of perirenal hemorrhage or extravasation The ureter and pelvis however were markedly distended with blood clot and fluid blood A decision had now to be made on either a radical or conservative procedure and the former was decided upon because it was felt that a further loss of blood was incompatible with safety and that nephrectomy

the First Surgical Division of Bellevue Hospital and are reserving our final conclusions until the five year follow up period determines the final outcome but in the meanwhile we feel the necessity of emphasizing the difficulties of discussion where no standardized nomenclature exists Dr Codman's Central Registry in Boston is the best answer to this problem and our material is being assembled for use there We feel also that neither pathologic section nor x ray furnish absolute basis for prognosis

### CASE II

The next case although of an entirely different type is also one that presented unusual difficulties as to procedure The patient a young woman of twenty three was admitted to St Vincent's Hospital on December 21, 1921 with the following history

Three weeks ago patient was struck by a motor truck in the right side and knocked to the ground She was taken home suffering from pain and difficulty in breathing and it was discovered that the tenth and eleventh ribs on the right side posteriorly had been fractured She stayed in bed for eight days and on the tenth day while at stool she was seized with sudden excruciating pain in the right lumbar region with occasional radiation to the right groin and pub Within an hour she passed considerable bright red blood and a few clots apparently per urethram The hematuria and blood clots continued for the next four days and were accompanied by frequent attacks of vomiting and abdominal distention On the fifteenth day the urine again became quite clear Two days later she was again a sudden attack of pain with a repetition of the symptoms above This subsided in three days and was followed by a three day interval of clear urine and freedom from pain and then in turn another recurrence

On admission urine was bloody but did not contain clots During the attacks of hematuria a large chamber would be filled with clots and what looked like pure blood Hemoglobin was 55 per cent red blood cells 3 600 000 blood platelets 310 000 coagulation time was four and one half minutes white blood cells

are markedly distended and show some adherent blood crusts. Histologically the scarred areas show fibrosis, replacement of parenchyma with surrounding hemorrhages into glomeruli and tubules and in some areas into stroma. Diagnosis: traumatic hemorrhagic nephritis.

The patient had an uneventful convalescence and was recently seen at a date about one year after her operation and has



Fig. 224.—Photograph of kidney after partial gastrectomy with removal of the stomach and duodenum. The kidney is shown in cross-section, having been moved from its normal position.

apparently accommodated herself satisfactorily to the loss of her kidney.

This is, I believe, a very unusual clinical picture, and after discussion with many other surgeons I have failed to make an altogether satisfactory explanation of the sequence of events. There seems little doubt that the cessation of hemorrhage must



was our only sure method of control. Nephrectomy was accordingly done and the kidney after removal immediately opened. The calices were found filled with large unorganized blood-clot. The upper pole was scarred and showed some perinephritic adhesions and an underlying area in the cortex which appeared pale and degenerated but no actual sloughing. It was felt that here in the upper pole there was probably a ruptured blood vessel which periodically clotted with subsequent loosening of the clot whenever the kidney resumed function (Figs 223 and 224)



Fig 223—Photograph of kidney from animal having received here set of blood from microscopical examination

The kidney was sent to Dr A Fraser Professor of Pathology at Bellevue Hospital and he returned the following report: Kidney shows scar encircling the upper pole the parenchyma above this is hemorrhagic and atrophied showing a nodular surface. A second similar deep irregular scar is seen on the under surface of lower pole and extending into the pelvis but not involving the ureter. The parenchyma here is in the same condition as that of the upper pole. The pelvis and calices

dition not often encountered in the ordinary surgical practice. The patient H. M., an Irish woman thirty-four years of age, was admitted to St. Vincent's Hospital on May 16, 1920. I had seen her in my office about six weeks previously and at that time she gave a history of attacks of cramp-like pains in the lower central abdomen on four different occasions at indefinite intervals during the past year. The first attack had been accompanied by vomiting and confinement to bed for two or three days. Subsequent attacks had been milder without vomiting or any relation to meals; bowels regular. Her past history was one of uninterrupted good health. She came from Ireland ten years ago and had never left the vicinity of New York. One week before admission she had her last attack and in this the central abdominal pain was followed by localization in the right lower quadrant. On physical examination persistent and well localized tenderness was elicited beneath McBurney's point. No mass could be felt. In every other way she seemed a woman in robust health. A diagnosis of chronic appendicitis was made.

Operation was performed on May 17th and the appendix removed through a McBurney incision. It was found bound down by adhesions, retrocecal in position with its distal half showing a much thickened wall and buried behind the ascending colon. It was delivered with some difficulty. The cecum appeared normal in every way and the base of the appendix was inverted beneath a purse-string suture without difficulty. The abdominal wall was closed without any suspicion that we had been dealing with any other condition than a chronic appendicitis with recurrent acute attacks. Upon removing the sutures on the seventh day I discovered a rather deep mural abscess which was opened and drained with the discharge of colon-smelling pus. During this first week there had been a persistent febrile reaction averaging about 100° F. From this point on and through the next three months there was a persistently increasing temperature reaction of the septic type with afternoon rises reaching finally to 103° F. and morning remissions almost to normal. On the seventeenth day a mass could be felt apparently in the muscle of the right flank and

have coincided with the temporary cessation of kidney function and that the recurrence of hemorrhages coincided with the resumption of kidney function with each time a resultant hemorrhage that would be fully as large as the previous one. What was the original picture within the kidney permitting a ten-day interval before the onset of the first hematuria and then leading to the ultimate discovery of a kidney showing no immediate extracapsular involvement?

There have been some similar cases reported in the literature 2 of which seem rather pertinent. The first is from Guy's Hospital Reports London 1892 in which Mr Reeves reported a case. A boy of nineteen fell from a cart and injured the right kidney. For nine days there was very slight hematuria but then almost pure blood was passed. Death at the end of the fourth week. Autopsy showed right kidney broken down to pulp with a false aneurysm of the renal artery. This case clinically resembled ours but the pathology is of course quite different.

Another case reported in St. Thomas Hospital Reports is as follows. A boy of fourteen was kicked by a horse in the region of the right kidney. There was no hematuria at the time but one week later severe pain, vomiting and hematuria developed. This recurred at intervals. A nephrectomy done fifteen years later showed a calcified hematoma of the lower pole with a layer of kidney substance spread over it.

Had it been possible to control our case without nephrectomy the final pathology might have corresponded to that in the last report. On the other hand it must be borne in mind that the ureter can become permanently plugged with blood clot leading to atrophy and breaking down of the kidney.

For co-operation and advice in determining the right procedure in this case I am deeply indebted to D. F. L. Keynes Jr.

### CASE III

The next cases brought up for discussion are not to demonstrate any new features in diagnosis or treatment but simply as an example of the clinical course of a complicated abdominal con-

dition not often encountered in the ordinary surgical practice. The patient H. M., an Irish woman thirty-four years of age, was admitted to St. Vincent's Hospital on May 16, 1920. I had seen her in my office about six weeks previously and at that time she gave a history of attacks of cramp-like pains in the lower central abdomen on four different occasions at indefinite intervals during the past year. The first attack had been accompanied by vomiting and confinement to bed for two or three days. Subsequent attacks had been milder without vomiting or any relation to meals, bowel regular. Her past history was one of uninterrupted good health. She came from Ireland ten years ago and had never left the vicinity of New York. One week before admission she had her last attack and in this the central abdominal pain was followed by localization in the right lower quadrant. On physical examination persistent and well localized tenderness was elicited beneath McBurney's point. No mass could be felt. In every other way she seemed a woman in robust health. A diagnosis of chronic appendicitis was made.

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because of this and increasing sepsis the operative wound was reopened. Induration and serosanguinous discharge was found along a tract leading down into the right iliac fossa. Rubber tube drains were inserted. This led to no improvement and a few days later the picture was complicated by the formation of a fecal fistula. The responsibility for this was erroneously put on the drainage tubes. From this period on the picture was one of successive areas of induration in the right groin, the right flank, the right perinephritic space and finally in the right costophrenic sinus. They were all characterized by marked induration, lack of tenderness or pain and a very moderate amount of suppuration. They were all opened widely and in the case of the costophrenic sinus a partial resection of the tenth rib was done. Wherever incisions were made chronic fistulae formed with rather thin foul grayish discharge and the operative procedures always tended to aggravate rather than relieve the sepsis. The first fecal fistula closed up spontaneously but a second one formed just to the right of the umbilicus. Up to this point a diagnosis had not been made. Smears had revealed colon bacilli and various contaminating organisms but no actinomyces. Repeated blood-cultures were all sterile. The blood-count varied between 14,000 and 26,000 with the polymorphonuclear count averaging about 83 per cent. Subjectively the patient was cheerful, had a good appetite and no complaints except at the operative procedures the consequent soreness in her right side and occasional attacks of diarrhea. There was surprisingly freedom from pain. Because of the tendency to sinus formation it was suspected that a foreign body such as a gauze sponge might have been left in the abdominal cavity so the fistulae were irrigated for several days with collargol and then x-rayed but no foreign body was revealed.

A liver abscess was now suspected and this suspicion was confirmed by an x-ray which showed the right diaphragm to be elevated and fixed. Exploration of the already existing sinus in the tenth interspace led us into a large abscess replacing about half of the right lobe of the liver and smears from this were sent to Dr Fraser of Bellevue University whom we followed the following

report The specimen shows numerous colonies of *Actinomyces bovis* surrounded by granulomatous reaction characteristic of actinomycosis This immediately made the whole picture quite clear but too late to have the therapeutic indications prove of any avail and the patient died of sepsis and exhaustion just four months after the original operation (Fig 225)



Fig 225—L w po m f m l b h w g t my t  
1

Undoubtedly the original focus was the appendix and had no operation been done the disease might have remained dormant for some time

A review of the literature indicates that as a rule these cases are either operated on early as was this under the diagnosis of chronic appendicitis or if left alone go on to the formation of a large actinomycotic mass involving the neighboring viscera and always advancing by direct extension disregarding anatomic

barriers The treatment has always been unsatisfactory and until recently was confined to very large doses of potassium iodid by mouth and iodin locally Some success in the treatment of actinomycosis by x ray has recently been reported Incision and drainage in abdominal actinomycosis has not been found to be of benefit and this was well demonstrated in our case in which the process had been invariably aggravated by this procedure Some operators report success with wide excision of the entire diseased area but this procedure has of course its limitations in abdominal actinomycosis

In conclusion let me emphasize for you again those features so well brought out originally by Dr John B Murphy who published in 1885 the first case of actinomycosis hominis recognized in this country There is an ache rather than a pain The infiltration in the iliac fossa is slow and very hard and the process tends to extend through the abdominal wall and when it does yellow sulphur like granules are discharged and these are pathognomic Actual suppuration is due to mixed infection The disease spreads by direct extension and never by the lymphatics In our case it will be noted the spread was upward the kidney to the diaphragm and directly into the liver The course is chronic and marked by sepsis and where the disease is suspected repeated daily smears must be made in the search for the actinomyces or ray fungi these are not easily found The treatment medically is potassium iodid in massive doses copper sulphate and iodin locally Surgically the treatment is wide excision where feasible Some benefit has been reported from x ray where the disease is superficial

## CLINIC OF DR. ELMER P. WEIGEL

NEW YORK POST GRADUATE MEDICAL SCHOOL

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### FRACTURE OF FLOOR OF ACETABULUM

The first case is one of a young woman aged thirty five school teacher who while riding on the right rear seat of a light automobile was hit by a heavy car as it skidded about a corner on the wet pavement in such a manner that the weight of the blow struck her just over the region of the right hip. She was unable to walk and was taken home in another car. After an examination by her physician it was evident that she had sustained a serious injury to her hip. She was sent to an x ray laboratory for examination and with these x rays she was admitted to the hospital and came under my care.

Upon examination I found a young woman of slight build normal in every way except for the injury to her hip which seemed to be very painful for she complained severely on the slightest movement. The right foot was somewhat everted and the leg was held in a position of abduction. Upon careful examination flexion at the hip seemed to be quite free and also a limited amount of rotation could be demonstrated without increasing her pain but when abduction or adduction was attempted she complained severely and practically no motion could be demonstrated. Measurements from the anterior superior spine to the internal malleolus showed  $\frac{1}{2}$  inch shortening on the right side. There was no crepitus noted during the examination but rather a peculiar sense of resistance to any motion. There was also a distinctly tender spot over the pubis on the right side. Temperature, pulse and respirations were normal. Routine blood and urinary examinations were also negative. An examination of the x rays showed that there had



been a fracture of the floor of the acetabulum in which the head of the femur had been driven thru h so that it encroached upon the lumen of the pel s to about one half the diameter of the head. There was no fracture of the femur. There was also a fracture of the ilium running from the acetabulum up to the free border as well as a fracture of the superior and inferior rhamni of th pubis anteriorly. In fact the appearance was one of a completely free fraement from the acetabulum behind to the fracture of the pubis anteriorly (F 226)



Fig 6—Ray m d t ly ft j ry h g f t f tabl m  
th head d t pel

The pati nt was taken to th operatin om mpletely anesthetized and f tened i t the Albe fracture tabl. The center of the le tracti n b rs w re s t at a p int outside the pati nt s hips and t ction wa applied in the c t i l p o t i o. Then the ri ht leg was strongly b ducted o as to pry the head of the femur out of the pelv s by using th gre t trochante as the fulcrum of a le r again t the side f the p l s. At the same time the tracti n became inc sed b cause th c nter of th traction bars were set at a p int outs de th patient s hips

With the limb in complete abduction a plaster of Paris spica was applied from the toes to the costal margin (Fig. 227). The plaster was allowed to remain on for a period of two months. *x* Rays taken through the cast showed the head of the femur practically in its normal position as far as its relation to the acetabulum was concerned but the fragments of the floor of the acetabulum remained driven in.



Fig. 227 — *x* Ray taken through cast of thigh made by the hospital. The head of the femur is in its normal position as far as its relation to the acetabulum is concerned but the fragments of the floor of the acetabulum remained driven in.

When the plaster was removed the patient had some motion in all directions but there was of course some stiffness due to the long fixation. Massage and manipulation were instituted. She was able to get about on crutches bearing some weight on the leg and soon learned to walk quite well.

Six months after the injury the patient was walking without crutch or cane and only with a slight limp. There was practically no actual shortening of the leg but rather an apparent lengthening due to the fact that a slight amount of the abduction had persisted. All motions of the hip were present but limited about

50 per cent x Ray showed a liberal callous formation about the acetabulum and this projected considerably into the pelvis.

This case is very interesting for several reasons. First because of the unusual way in which the force was applied to drive the head of the bone through the acetabulum and fracture the ilium above and the pubis in front and yet at the same time not fracture the femur itself or cause any serious injury to the interpelvic organs.

Second it was an ideal case for the use of the Albee fracture table and I doubt very much if we would have been able to get it in as satisfactory position without the table. I feel that ordinary traction out straight would simply have locked the head more firmly behind the fragments of the ilium the head having slipped through and the fragments having encroached upon the neck. By using the table we were able to get the combined action of traction and the leverage action of the abduction and at the same time having the traction increase with the abduction.

Third in spite of this extensive fracture there was no damage to the pelvic viscera. This would have been manifested by bloody urine or pain or discomfort of any sort. The encroachment on the pelvic inlet was such that we considered it advisable to caution the patient against the possible interference with future delivery should she become pregnant.

## COMPRESSION FRACTURE OF SPINE

C M A man thirty eight years of age working as a lineman for the telephone company In June 1921 he fell from a pole the distance of 30 feet He landed on his feet and the weight of a heavy kit of tools which he had strapped to his shoulders together with the impact of the fall caused him to double up so that his head was between his legs as he described it He was removed to a hospital in an ambulance where he was carefully examined and kept in bed for one week No fractures were found and except for a few bruises he was thought to have escaped without serious injury At the end of the week the greater part of the shock having subsided he was taken home and allowed to start walking about Thus he did with some difficulty and the aid of a pair of crutches He complained severely of the pain in the lower part of his back and radiating down both legs to the knees Thus was particularly severe on the right side He received balm and massage to his back and legs but except for the immediate effect of the sense of well being he was not relieved His spine was then x rayed and pronounced normal An x ray of his teeth was taken and several suspicious ones were removed His tonsils were inspected and treated but to no avail On several occasions his back was strapped with adhesive plaster but this did not relieve him

He came under my care in March 1922 a man much broken in spirit and despairing that any real help might be obtained He walked with two canes and I noticed as he entered the office that he was very careful to avoid any jars or missteps He took a straight back chair and as he sat down he lowered his weight with his hands He complained of severe pain in the lower part of his spine whenever he was on his feet and said that he only found relief when flat on his back in bed

Upon examination I found a well developed man of medium

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the Buckey diaphragm. These x rays showed a partial destruction (Fig 228) of the body of the fifth lumbar vertebra and the intervertebral disk between it and the fourth lumbar vertebra. There was also some proliferation of new bone growth in this region.

I decided to immobilize the spine by a bone graft. We feel that this is the treatment of choice in any case of compression



Fig 229—x Ray taken by the Buckey diaphragm showing the fracture of the fifth lumbar vertebra and the intervertebral disk between it and the fourth lumbar vertebra.

fracture of the spine without paralysis. The location of the fracture in this case made it additionally necessary to resort to this treatment inasmuch as it is absolutely impossible to get adequate fixation of the lower lumbar spine by external methods unless the fixation dressing include both thighs.

The patient was admitted to the hospital and under general anesthesia a graft taken from the crest of the left tibia

stature with a well nourished musculature which had become somewhat softened from months of non use. Head, chest and extremities were negative. He held his spine rigid particularly the lower half. There was pronounced muscle spasm present in this area. In flexing and extending his spine he seemed to bend rather from the hips than from the spine itself. All these



Fig. 228 — Kay h g p f f h body f th af b  
l mb rt b

motions were complicated by a great deal of pain. Motion of the hip was free but when the hips were flexed with the knees extended he complained severely of the pain in his back. No kyphosis was present but there was a peculiar fulness in the lumbar region which the general induration of the normal iliacs. He was ray listed peculiarly with

## JOINT MOUSE IN KNEE WITH FRACTURE OF EXTERNAL CONDYLE OF FEMUR

D J male adult thirty years of age presented himself for treatment complaining of pain and inability to completely extend his right knee. He had had trouble for some time but the acute symptoms date back three weeks. For the past three or four years he has had trouble with this knee. There is no history of injury but a gradual onset of pain swelling and general weakness and at times a feeling of something slipping around in the knee joint. There has been a great deal of grating and cracking in the joint but patient gives no history of any distinct locking. Sometimes while walking he would feel something slip in the joint and these attacks would cause pain and invariably be followed by swelling which lasted for several days. Patient does not remember that these attacks were ever such that knee became locked and could not be extended. However these symptoms were such that he realized the knee to be weaker than the left one and he took great pains to guard it from injury. He wore an elastic knee cap. No other joints showed any symptoms and other than this he was perfectly healthy.

Three weeks before he came under my care while playing tennis he leaned over to the right side to get a low ball and felt something give way in his knee joint. He fell to the ground and the pain was very sharp and acute. He was carried from the court and taken home where he remained in bed. The following day the knee was swollen and very tender and could not be straightened out. This condition persisted and except for a diminution of the swelling remained this way until I saw him three weeks later. In the meantime he received baking massage and the application of several types of liniment and also had the knee strapped with adhesive plaster.

When I saw him he was walking on crutches bearing no



was placed into the spaces of the lower lumbar vertebrae by the usual technic as recommended by Dr. Albte using the motor saw. The lower end of the graft was cut wedge shape and driven into a tunnel made in the sacrum. The graft extended up as far as the third lumbar vertebra. The fascia was drawn together over the graft with medium kangaroo tendon and the skin was closed with plain catgut. No plastic cast was applied. The patient was kept flat on his back in bed on a fracture mattress for six weeks. Both the wound in his back and the one



Fig. 230—Photograph showing the patient from the front, with the graft in the lumbar space.

in his leg he led readily. At the end of this time he was allowed up gradually and left the hospital using a cane at the end of the eighth week.

Two weeks later he decided to begin walking a quarter of a mile and gradually increased until he could walk three miles without tiring. His former pain had left him and at the end of four months he went back to his former work which he could now do without pain or discomfort. A roentgenogram of his spine taken one year after the operation shows the graft in place with considerable callus about it (Figs. 229, 230).

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When I saw him he was walking on crutches bearing no

weight on that leg. The knee was slightly swollen and distinctly tender over both sides of the patellar tendon. The extension was limited by about 20 degrees and attempts to straighten the leg caused great pain (Fig. 231). The x-rays showed two distinct foreign bodies in the joint which appeared to be smooth and looked as if they were free in the joint. The x-ray also showed a certain amount of joint distention from the fluid. I made a diagnosis of foreign bodies (joint mice) in the joint and advised operation to remove them. I felt that these had un-



Fig. 231.—Ray hinged laterally to show foreign bodies which appeared to be free in the joint. The x-ray also showed a certain amount of joint distention from the fluid. I made a diagnosis of foreign bodies (joint mice) in the joint and advised operation to remove them.

doubtedly been there for some time and the acute pain that came on while he was playing tennis was probably caused by the foreign bodies between the condyles and the tibia.

The patient consented to the operation and was admitted to the hospital. In opening this knee joint I decided to do the split patella incision because the history was by no means definite and one could not feel any more about the location of the foreign bodies. I feel in these cases where it may become necessary to explore the whole joint the split patella incision is recommended by Sir Robert Jones. The

one of choice because it makes all parts of the joint accessible without in any way damaging the knee joint itself. The patella was split with the motor saw and the quadriceps and the patellar tendons were severed longitudinally with the knife. As the joint was opened there shot up into the incision a small white glistening foreign body the size of a pea and firmly attached by a pedicle to a position between the condyles of the femur. I felt sure that this was the cause of the trouble but decided to explore the joint thoroughly and upon flexing the knee found



Fig 232 — Ray f k h g dt aft m l f j t  
df t f gm t f dyl

just behind the external condyle a piece of joint cartilage about the size of the thumb nail and  $\frac{1}{2}$  inch in thickness. Directly above this upon the external condyle of the femur was a punched out depression from which the piece of cartilage had become separated. This piece of cartilage was so wedged between the tibia and the femur that it prevented the complete extension of the joint but as soon as it was removed this tension became relieved and the leg could again be extended. Further investigation revealed nothing more abnormal and the wound was closed in layers being careful not to leave any openings into the

weight on that leg. The knee was slightly swollen and distinctly tender over both sides of the patellar tendon. The extension was limited by about 20 degrees and attempts to straighten the leg caused great pain (Fig. 231). The x rays showed two distinct foreign bodies in the joint which appeared to be smooth and looked as if they were free in the joint. The x rays also showed a certain amount of joint distention from the fluid. I made a diagnosis of foreign bodies (joint mice) in the joint and advised operation to remove them. I felt that these had un-



Fig. 231—Ray hanging perpendicular to the film. The two dark spots are the foreign bodies. The joint is distended by fluid.

doubtedly been there for some time and the acute pain that came on while he was playing tennis was being caused between the condyles and the tibia.

The patient consented to the operation and was admitted to the hospital. In opening this knee joint I decided to use the split patellar incision because the history was so very definite and one could not feel any too sure about the diagnosis or the location of the foreign bodies. I feel in these cases where it may become necessary to explore the whole joint the split patella incision is recommended by Sir Robert Jones as the

## FRACTURE OF TIBIA WITH LOSS OF SUBSTANCE

T R T a male adult aged fifty was struck in the right leg by a heavy plank while working as a carpenter. He sustained a compound fracture of the tibia at the junction of the middle and the lower third. There also was a simple fracture of the fibula in the upper third. The patient was taken to the hospital and was operated upon by his doctor to remove some loose pieces of bone. A splint was then applied and the wound was dressed daily. While there was a good deal of granulation tissue formed the bone did not entirely cover over and continued to discharge. Several attempts to overcome this were made by scraping the bone but the sinuses were obstinate and continued to discharge. After six months of this kind of treatment had gone on and the leg was still not healed the patient decided to change physicians and was taken to another hospital. The surgeon who now had charge of the case decided to remove the whole thickness of the bone because of the existing infection and consequently took out 3 inches of the tibia cutting the shaft entirely through above and below with a saw (Fig 223). About three months after this operation the wound stopped draining and became healed. There was of course no union present and it was necessary for the patient to use crutches.

Shortly after this the case came under my care. There was a frank non union of the tibia with about 3 inches of loss of substance. There was still a small scab on the wound and when this was removed I found a small sinus that led to a little piece of sequestered bone in the soft parts. This was removed and the wound healed quite promptly. Due to poor fixation early in the treatment of the case the fracture at the upper end of the fibula became malunited in such a manner as to cause a bow leg deformity of the leg. I recommended that the loss of substance of the tibia be replaced by a bone graft from the other tibia. However I felt that it would not be wise to do this until

joint cavity. The tendon just above and below the patella was held with a stitch of kanaroo tendon. The skin was closed with plain catgut and a posterior plaster splint was applied for a period of two weeks. At the end of this time the dressing was changed and the wound had healed by first intention. The splint was then removed and the patient encouraged to bend the knee. He received massage and manipulation daily. At the end of three weeks the patient left the hospital the knee feeling much better and the tenderness having entirely disappeared. He could now completely extend the right knee.

At the end of two months the patient was walking without any support and feeling entirely cured (F. v. 237).

This case is of particular interest because it shows the wisdom of using the split patella incision in all knee cases where one may have occasion to examine the whole joint. If we had made a lateral incision in this case it would have been very difficult to remove the punctuated joint mouse and we never would have discovered the broken fragment of cartilage behind the external condyle.

This incision enables us to explore the whole joint thoroughly without doing any permanent damage to the joint itself.

tibia was incised similarly and with a twin saw in which the blades were set slightly farther apart than those in the first one used a graft of the required length was cut from over the marrow cavity. By cutting the graft with a saw of somewhat wider gauge the graft fits snugly into the gutter. The loops of kangaroo tendon were now lifted out of the gutter and the graft passed beneath them and fitted into its bed. The tendons were now tied over the top of the graft to hold it securely in the gutter.

An additional very narrow sliver graft was then cut from the left tibia just alongside of where the main graft was taken and this was also placed beneath the kangaroo tendons to add some additional bone growing surface. The wound were then closed with plain catgut and a circular cast applied to the right leg from the toes to the groin. This was allowed to remain for ten weeks and when it was removed the leg was solid (Figs 234-235). An x ray was taken which showed the two grafts in place and both proliferating bone. The patient was then allowed to begin bearing weight gradually.

This case demonstrated a mistake which is frequently made namely the removal of too much bone in an effort to cure an osteomyelitis. It is always necessary to remove enough bone to allow the soft parts to fall into place but rarely is it necessary in doing this to remove the whole shaft of the bone and in that way break the continuity. If the bone is removed in such a way as to create sloping walls out of overhanging ones it will usually be possible to get the wound to heal and yet not break the continuity of the bone.



the leg had remained healed for at least two months so as to prevent as far as possible any chance of stirring up the old infection.

After about ten weeks time I performed this operation. A curved incision was made over the inner side of the tibia and a flap of skin directed down to the periosteum. With the twin saw a gutter was cut in each fragment for the distance of about



Fig. 233



Fig. 234



Fig. 235

Fig. 233—Ray h g vt l ft b u j st ft l gh heal d

Fig. 234—Ray h g gr f pl ce f t w ks t m N t

p l f rat f bo bo t l e graft

Fig. 235—Lateral sam leg

2 inches. The ends were cut off with the small saw and these two fragments were removed. Great care was taken to be sure that sclerosed ends of the tibia adjoining the gap were sufficiently removed in the line of the gutter so as to allow the graft to come easily in contact with the marrow substance of each fragment. Two holes were then drilled in each fragment and kangaroo sutures passed through. The measure and pattern of the required graft was then taken with a flexible probe. The thir

# CLINIC OF DR RICHARD LEWISOHN

MOUNT SINAI HOSPITAL

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## INFLAMMATORY TUMORS OF THE OMENTUM

Comparative Frequency of Postappendicular Omental Infections and of Torsion of the Omentum    Rarity of So called Primary Inflammatory Tumors of the Omentum    Report of Two Cases    Etiology    Differential Diagnosis    Pathology

INFLAMMATORY tumors of the omentum secondary to abdominal operations are by no means rare. For instance they are not uncommonly encountered in the postoperative course of a gangrenous appendicitis with general peritonitis. Infections of the peritoneal cavity may develop omental tumors with one or more abscesses which are frequently surrounded by inflamed omentum.

Furthermore omental tumors of considerable size are sometimes encountered following operations for hernia (inguinal femoral umbilical etc.) In spite of the absence of infection large tumors are formed which may cause intestinal obstruction. Their etiology is not quite clear. However it is very probable that following the hernia operation a small part of the omentum becomes adherent at the site of the operation. This attachment interferes with the motility of the omentum. A portion of the omentum being fixed the omentum is apt to twist on its longitudinal axis (so-called torsion of the omentum). Further sequelæ may be gangrene of the omentum or intestinal obstruction.

In contrast to these two types of omental tumors caused by peritoneal infection or a mechanical abnormality the primary inflammatory tumors of the omentum are extremely rare.

Before discussing etiology and pathology of these tumors I wish to present to you 2 cases belonging to this group.



The finger inserted into the free peritoneal cavity revealed that the tumor consisted of omentum. The tumor was dissected from the abdominal wall. The adhesions between the tumor and the abdominal wall were so dense that part of the parietal peritoneum was dissected away with the tumor. It is much safer in freeing adherent tumors to sacrifice a strip of peritoneum so as to avoid the possibility of entering the tumor.

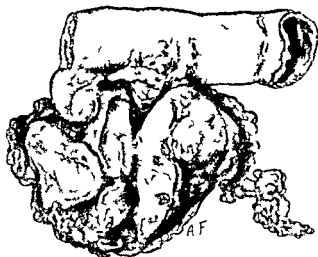


Fig 236—Cross section of the transverse colon showing the tumor attached to its outer surface.

The tumor was densely adherent to the transverse colon. Palpation of the intestinal lumen did not reveal any malignancy of the gut. However the possibility of a small new growth with perforation into the omentum had to be considered. Furthermore the mass was so densely adherent to the wall of the intestine that it appeared to be impossible to resect the tumor without entering the intestinal lumen. For these reasons a primary resection of the affected parts (transverse colon and omentum) was decided upon.

## CASE I

The first patient D S aged fifty three admitted May 15 1922

**Previous History**—The patient developed pain in the right lumbar region about nine months ago. This pain lasted for three months. The pain then shifted to the right lower quadrant where it still persists. It is dull in character and has no relation to meals. No vomiting, no sour eructations. Patient has lost 12 pounds in six weeks.

**Status**—The patient is rather anemic. Heart and lungs are normal. In the right lower quadrant opposite the umbilicus a hard oval mass is palpable. This mass is nodular and about 8 cm in diameter. It does not move with respiration. The mass is slightly tender on palpation. Rectal examination is negative.

**x Ray examination** of the colon with the aid of a barium enema shows a marked distention of the rectum and redundancy of the sigmoid. There is spasticity of the transverse and descending colon and an apparently persistent defect in the caput coli. It is difficult to state whether the latter is due to a new growth or only to spasm.

The cachectic appearance of the patient here and his loss of weight, the character of the mass and the x ray defect in the caput coli suggested carcinoma at the ileocolic junction.

**Operation**—I made a 5 inch incision through the right rectus muscle. After division of the muscle a nodular mass was felt adherent to the parietal peritoneum. The incision was extended at its lower margin in order to enter the free peritoneal cavity.

Whenever you find adhesions between intra abdominal organs and parietal peritoneum extend your incision either upward or downward before you try to liberate these adhesions. After you have thus entered the free peritoneal cavity you can proceed safely to deal with the adhesions. The only exception to this rule is in the case of late intra abdominal abscesses where a drainage of the abscess without opening of the free peritoneal cavity is the logical procedure.

**Macroscopic Report**—The specimen consists of a resected segment of the transverse colon together with a portion of mesentery and adherent omentum. The gut measures about 10 cm in length. The mucosa shows a small scar at the center of the resected portion. The omentum is densely adherent at this site. There is no perforation of the intestinal wall. The omentum is markedly infiltrated and is the seat of multiple abscesses varying in size from 1 to 3 cm in diameter (Fig. 236).

**Microscopic Report**—The omentum shows chronic inflammation with marked fibrous and many circumscribed areas of acute purulent inflammation (Fig. 237).

**Postoperative Course**—The patient made an uneventful recovery and was discharged on June 20, 1922.

**Re-examination** (December 3, 1922)—Patient feels perfectly well. He has gained 33 pounds since the operation.

It is a curious coincidence that we should run across 2 cases of a rare type in rapid succession. We encountered this phenomenon—the so-called duplicity of cases—while the patient whom I just presented to you was still in the hospital recovering from the operation.

## CASE II

H. S., aged thirty-seven, admitted June 12, 1922.

**Previous History**—Eight years ago the patient had an operation for chronic appendicitis. He made an uneventful recovery and was free from abdominal symptoms for over seven years. Seven months ago he noticed a pain in the epigastrium somewhat above and to the right of the umbilicus. Two months ago he noticed a mass in the upper abdomen which has gradually grown larger. No vomiting, no history of hematemesis or tarry stools.

**Status**—Lungs and heart are normal. The upper abdomen is held slightly rigid on palpation. A firm tender mass is felt in the epigastrium extending from the middle of the right lower border of the rib to the left of the ensiform process. It moves slightly with respiration. A 3-inch linear scar is present in the right lower quadrant. Rectal examination is negative.

After ligation of the vessels 3 inches of transverse colon with the omental tumor attached were resected *en bloc*. Both ends were closed with three layer sutures. The intestinal lumen was re established by a side to-side anastomosis. Drainage of the abdominal cavity was effected with two pieces of rubber-dam placed at the site of the anastomosis.

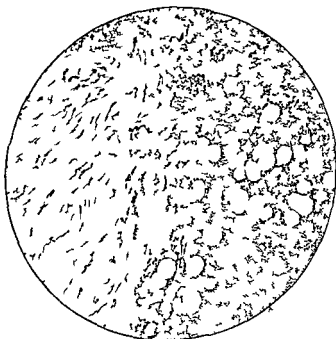


Fig. 37—Case I. Microscopic section showing the histological features of the tumor.

The use of packing at the site of intestinal anastomosis is not recommended because they are apt to cause leakage. The packing becomes attached to the suture line. When you remove the packing you are apt to establish a fecal fistula.

The abdominal wall was closed in three layers. The first layer of strong chromic gut for peritoneum, muscle and fascia and some interrupted fine silk sutures for the skin.

**Microscopic Report** —The omentum is greatly thickened and fibrosed. A few small areas of acute purulent infiltration are present (Fig 239)

**Postoperative Course** —The patient made an uneventful recovery and left the hospital on July 2 1922. He presented himself one month after his discharge in perfect condition.

December 1922. Patient cannot be located.

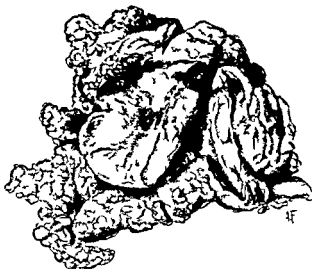


Fig 238 — Case II. Chronic inflammatory tumor of the omentum.

The etiology of these so called primary inflammatory tumors of the omentum is rather doubtful. The majority of them are probably caused in the following manner. A small foreign body (fish bone, chicken bone, tooth pick, etc.) is accidentally swallowed by the patient. On its way through the intestine such foreign body may be temporarily caught in the mucous membrane of the gut before the peristalsis pushes it on. It is passed per rectum embedded in feces, very often unnoticed by the patient who may not have been aware that he (or she) had swallowed a foreign body. While temporarily arrested in one of the folds



**x Ray Examination**—The stomach was situated high its tone and peristalsis were normal. The duodenal bulb could not be visualized. On account of the high position of the stomach the bulb was situated posteriorly to the antrum. The food at once started to pass through the pylorus and the stomach appeared to be emptying rapidly. Six hours post cibum it was empty. At this time some of the barium was in the terminal ileum and the rest in the cecum and ascending colon. The cecum was somewhat fixed and tender. Twenty-four hours post cibum the colon was irregularly outlined from the cecum to the rectum.

If I had not benefited from the experience of my first case I might have erred in making a correct diagnosis. For instance I might have diagnosed a mesenteric glandular tumor. However benefited by the observation of the first case I made the diagnosis of inflammatory tumor of the omentum.

**Operation**—Upper right rectus incision 3 inches long. As in the previous case the intra-abdominal mass whose exact nature I did not know was adherent to the exposed area of the parietal peritoneum. Therefore I extended the incision below thus enabling me to enter the free peritoneal cavity without disturbing the relationship of the intra-abdominal mass to the parietal peritoneum. The mass consisted of acutely inflamed omentum. I was now able to safely free the adhesions to the abdominal wall without the risk of entering a scus. The omentum was dissected free from its attachment to the transverse colon by double ligation. It was so closely attached to the transverse colon that the peritoneum was stripped off over small area. This defect was closed with three interrupted chromic sutures. I was able by careful dissection to find and enter the lumen of the intestine. The abdominal wall was closed without drainage. Through and through chromic gut was used for peritoneum muscle and fascia and silk for the skin.

**Macroscopic Report**—The specimen consists of inflamed omentum measuring about 10 x 8 x 3 cm. The inflamed omentum shows sections of hemorrhage with necrosis and infiltration of the fat with dense fibrous tissue (Fig. 238).  
**Diagnosis** Chronic inflammation of the omentum.

transverse colon which was densely adherent to the omentum. As it happened we were able to dissect away that portion of the omentum from the intestine without entering the lumen—certainly a much safer procedure than resection of the intestine.

A correct diagnosis is rarely made before operation. As these tumors are hard and nodular they are usually diagnosed as intestinal neoplasms or mesenteric tumors of cystic or glandular nature. In women they may be erroneously diagnosed as ovarian tumors.

These tumors though purely inflammatory in nature may represent microscopically a picture very similar to the round cell sarcoma. Great care should be taken to avoid an error in diagnosis. The importance of a carefully guided decision is very obvious. Whereas an intra abdominal malignancy always gives a doubtful prognosis the inflammatory tumors of the omentum can be permanently cured by simple resection.

If a doubt exists at the time of the operation as to the nature of the tumor such a tumor should be resected. Primary malignancy (sarcoma) of the omentum is even rarer than the inflammatory tumors. Even though the mass may appear malignant the patient ought to get the benefit of the doubt and the possibility of being permanently cured by a comparatively simple operation.

of the mucosa this foreign body may have caused a small necrotic area of the mucous membrane. This area of *necrosis*, therefore, represents the portal of entry for the infection. Cocci and bacilli which are so numerous in the intestinal flora can then easily wander into the omentum where they cause acute inflammation with abscesses (see Case I) or the more chronic type (see Case II).

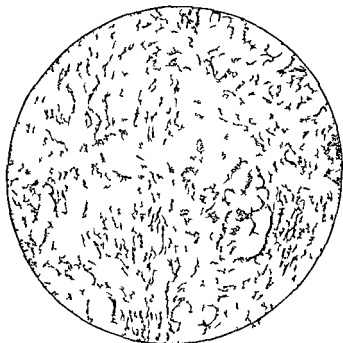


Fig. 239—Microscopic section showing inflammation with abscess formation (Case II)

You will remember that in the macroscopic report of the segment of resected transverse colon (Case I) the only abnormality mentioned was a small scar. Such a scar probably represents the healed end result of a previous trauma. This scar was very fine and minute and was detected only after careful search. It is very probable that in Case II we could have demonstrated an identical fine scar if we had resected the tip of the

CONTRIBUTION BY DR NATHAN W GREEN

NEW YORK

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### SUDDEN HEMORRHAGE AN OCCASIONAL CAUSE OF DEATH IN EPITHELIOMA OF THE ESOPHAGUS

DURING the past two years I have had 3 cases of sudden and fatal hemorrhage in carcinoma of the esophagus. Two were after radium treatment. One died without the therapeutic use of the x ray or of radium. All 3 died with very little warning. All 3 were up and about. Two had premonitory cough; these were the 2 after radium treatment. Each of these died with an overwhelming hemorrhage only a short time after cough was noticed. The third, who had not had radium, first noticed a little staining on his handkerchief. Ten minutes after this he had a violent hemorrhage and seven hours later another and later a third from which he died.

In only one of these cases were we fortunate enough to obtain an autopsy. The rarity of this cause of death and the still greater rarity of an autopsy in this complication makes this case of peculiar interest and leads me to report it somewhat in detail. This one (J. B.) gave a long and indefinite history of imperfect esophageal functioning with the picture of delay at the cardia. On one esophagoscopy the epicardia remained closed during respiration as if by some spasm. An ulcer was also detected on the posterior wall of the esophagus opposite the tracheal bifurcation. This ulcer was a flat epithelioma about 4 cm. in length by 2 cm. in breadth. At autopsy a small gland was found near the bifurcation of the trachea but no metastases and no marked involvement of glands were present. The epitheliomatous ulcer was flat and apparently did not extend below the muscular coat of the esophagus. In the middle of



platinum of 189 m c for four hours making 756 m c hours to the esophageal site. No upset followed this treatment and he was discharged on February 19th improved.

On July 20, 1921 he had 4 tubes with  $\frac{1}{2}$  mm platinum filter of 123 m c for five hours making 615 m c. hours to the esophageal site. He was discharged July 28th. He was now fairly comfortable and swallowing soft solids besides using his gastrostomy tube.

However on August 11, 1921 after excessive cough for a few days he had a violent hemorrhage and died suddenly.

Case II—G. T. a man fifty years of age was referred to me in May, 1921 with a history of throat trouble and dysphagia for solids.

On May 28, 1921 he was admitted to Division 1, St. Luke's Hospital and roentgenograms taken by Dr. LeWald located a growth about the midportion of the esophagus. This later was confirmed by esophagoscopy and was reported carcinoma of the esophagus of the squamous cell type.

On May 31, 1921 a Janeway gastrostomy was done and while in the hospital his thumb was removed on June 14th for an epithelioma which apparently followed an infection. This also was reported by the pathologist Dr. Knox as a metastatic squamous cell epithelioma.

He was then referred to the Memorial Hospital and on July 7, 1921 248 m c of radium emanation was left *in situ* for four hours. His swallowing improved following this treatment and on July 12th he was discharged.

On July 30, 1921 I made a visit to his house where he appeared to be improved. At about noon of that day he had a sudden overwhelming hemorrhage and died.

Case III—J. B. a man fifty eight years of age was referred to me by Dr. LeWald with the roentgenologic report that there was delay in the region of the aortic arch indicating the presence of new growth but this required confirmatory examination and an esophagoscopy was advised.

this cancerous area was an eroded intercostal artery. On splitting open the aorta this proved to be the first right intercostal (probably the right side). From this the fatal hemorrhage had come.

These 3 cases are so nearly alike in the picture they present and in their mode of exit so nearly identical that it seems safe to assume the other 2 died also of an erosion of an intercostal vessel close to the aorta. The location of the malignancy in all 3 was similar that is near the tracheal bifurcation.

This contribution is submitted to call attention to the fact that massive fatal hemorrhage may occur in the course of carcinoma of the esophagus. It is of particular interest in that it is here shown from what vessel the fatal hemorrhage may come.

I have not seen a profuse hemorrhage from the esophagus where the growth was situated near the cardia.

The following is a brief history of each of the 3 cases.

**Case I**—A B a man fifty nine years of age was referred to me on January 17 1921 with a history of dysphagia for solids for the past nine months. Also at that time blood appeared on the stomach tube when it was withdrawn.

The roentgenograms taken by Dr. William H. Stewart showed an obstruction of the esophagus.

When he lay down or when food went down he gave a history of froth coming up.

On January 24 1921 he was admitted as a private patient to St. Luke's Hospital with the additional history of loss of weight and production of some bright red blood.

On January 25th an esophagoscopy was done by me and the diagnosis of carcinoma of the esophagus near the middle about 13 inches from the incisor border established.

On January 28th a gastrostomy of the Janeway type was done under gas and oxygen and he was discharged on February 14th improved.

I referred him then to the Memorial Hospital where I gave him radium treatment twice as follows.

On February 16 1921 he had 3 tubes filled with 1 mm

On December 10th the patient left the hospital without incident.

On January 4 1922 he came to my office where a No 36 and No 38 French bougie was pas ed with ease and without trace of blood

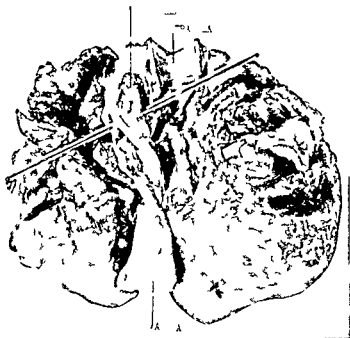


Fig 241—Case III A t p y f i d g Th d d g r t a p l t  
pen d gla d p s s th gh th f i t g h t t t l r t r y t  
springs f m th r t d m g th gh th t f th l t d g r w h  
h n Fig 242 (Ph t g r p h t k by M W K l l )

Again on January 18th a No 36 bougie passed easily with no blood He was given bismuth subcarbonate and soda bicarbonate powders

On February 7th he weighed 151 pounds He said at this time that he was *so sore* across his chest that he did not want a bougie passed



On December 6 1921 he was admitted to Surgical Division A St Luke's Hospital for diagnosis. His chief complaint was dysphagia for six weeks and pain in midchest on swallowing.

On December 8th the esophagoscope was passed with the following picture. The cardia of the stomach opened and



Fig 240—Ca III Ep th l m f th soph g ppost h cross g  
f th l ft b h t heal b f cat Th locat f l t d  
gr th is h t T D l y th pa g f th b m th lso h w t  
E This case ded from lce f f t gh t tal rt ry ea de-  
sc ding t A t psy bt d (Roe tg ogr m by D L T  
LeW ld)

closed normally the orifice a n rmal in iz and the esophagus throughout seemed normal except fo n area about 10} inches from the teeth which seemed to bleed mewhat more readily than ther portions The area hich bled readily was touched with 10 per cent sil er n trat and a \ 36 bougt was readily passed into the stomach

roentgenograms showed delay in the esophagus with some irregularity in the region of the aortic arch

On November 14th he was esophagoscoped and at this sitting the cardia remained closed during respiration and an ulcerated area was found which bled on the posterior wall of the esophagus at the level of the tracheal crossing

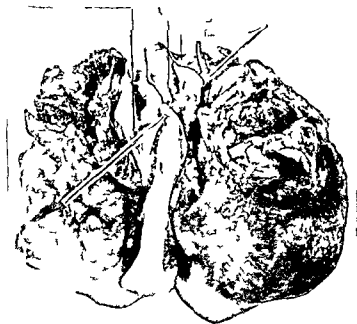


Fig 242—Case III. Atypical. The glandular growth in the epithelium of the posterior wall of the esophagus at the level of the tracheal crossing. (Photograph taken by M. W. Hall.)

The soreness still persisted

On the morning of November 20, 1922 he had a slight cough and blood tinged his handkerchief. At 11 A. M. he had a massive hemorrhage which rendered him unconscious for awhile. At 6 P. M. he had another and lost consciousness and after a third he died early on the morning of the 21st.

On February 28th he said that he could swallow meat but when he did so he felt it under the middle of his sternum

On March 14th he weighed 154 pound but he still complained of soreness in his esophagus and across his chest in front when swallowing. A bougie hurt him and was passed only with the utmost delicacy for 9 inches

On April 21st he still complained of pain across the front of his chest at the level of the third costal cartilage. He was referred back to Dr. LeWald for further roentgenograms

On April 28th he reported that the roentgenologic examination showed some delay at the lower end of the esophagus as being still present which probably required further observation with the esophagoscope. The stomach showed slight delay in its emptying time. The fluoroscopic examination showed slight delay in the region of the aortic arch also at the cardiac end of the esophagus. The stomach was dilated the greater curvature was about 3 inches below the umbilicus. No filling defect as observed in the stomach or the duodenum. The stomach was emptying at a fair rate. There was a small retention for four hours and fifty five minutes. (A dilated stomach is unusual in cases of esophageal obstruction)

On May 12th he still complained of soreness across his chest. A No. 32 bougie was passed for 10 inches with great gentleness after this point it was so sore that he would not let it pass further. There was no blood with any of these attempts.

He went away to the country for a month and was advised to come into the hospital when he returned for observation.

On June 23d he said that he felt fine but was awful sore across his chest.

On July 11th he still complained of soreness especially in his right chest and could only lie in one position.

On October 2d he complained of tenderness in the epigastrium and pain under the right shoulder and still had a soreness in the right chest. It hurt him to swallow. He had been gaining weight steadily until recently when he began to lose again.

He reentered the hospital on November 8th for further examination and was x-rayed again on November 10th. The

# CLINIC OF DR DE WITT STETTEN

LENOX HILL HOSPITAL

## ANOMALOUS RELATIONS OF THE CYSTIC DUCT OR GALL-BLADDER TO THE HEPATIC DUCT

I would like to present to you 2 cases of anomalous relations of the cystic duct or gall bladder to the hepatic duct in one of

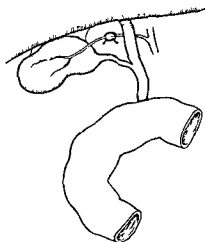


Fig 243—Usual relation of cystic artery to junction of cystic duct of hepatic duct forming so called triangle of Calot. Typical illustration of cystic artery

which the hepatic duct was unwittingly injured and in the other injury was avoided because the anomaly was recognized in time. You may know that according to Calot<sup>1</sup> the cystic artery normally forms with the junction of the cystic and hepatic ducts a triangle which has been termed the triangle of Calot (Fig 243). This arrangement however is by no means con-

Calot D la Ch lécy t et m. Thès d P ri 1890 N 52 p 50

At the autopsy the first intercostal from the descending aorta was found eroded at the middle of the cancerous ulcer of the esophagus. His stomach contained 1 liter of blood. A straw passed directly through the first right intercostal came out at the middle of the area of the esophageal ulcer. There were no metastases and there was one small gland near the bifurcation of the trachea. The epithelioma had not penetrated deeper than the muscular coat of the esophagus. The pathologic report by Dr. Knox was epithelioma of the squamous-cell type.

hypochondriac incision. A small somewhat thickened gall bladder was found adherent at its fundus to the duodenum. It contained one small ovoid stone. No calculi were palpated in the ducts. I separated the gall bladder from the duodenum and found when the gall bladder was freed a small fistulous opening into the duodenum. This was closed with a single purse string suture of silk. I then proceeded with the cholecystectomy in the usual fashion from above downward. This was by no means exceptionally difficult. After separating the

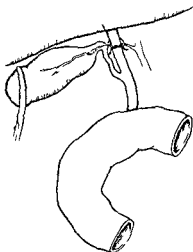


Fig 244—C. I. P. U. l. m. f. c. y. t. d. h. p. a. t. d. c. t. w. i. t. h. l. i. g. a. t. e. f. y. t. r. t. y. d. t. l. l. y. l. d. g. h. p. t. d. t.

gall bladder from its bed in the liver I very carefully passed the usual ligature around what I took to be its mesentery and divided with my scissors the tissues distal to the ligature. I was very much dismayed to find a gaping lumen of about 0.5 cm diameter in these tissues. I at once suspected what I had done and removing the ligature caught the cystic vessels separately and ligated them. I then placed a gauze tampon against the proximal lumen of what was undoubtedly the completely divided hepatic duct from which the bile literally poured. The anatomic

stant The cystic duct may run parallel to the hepatic duct or may even make a spiral turn behind it Re has estimated the cases of parallelism as high as 33 per cent. In other cases the cystic duct itself may be practically non-existent and the gall bladder may lie in a parallel relation to the hepatic duct Injury to the hepatic or common duct due to a failure to recognize these abnormal relations is not an unusual accident and has been reported on by W J Mayo Koerte Kehr <sup>4</sup> Eliot Eisendrath and others My purpose in presenting these 2 cases to you is to demonstrate how easily duct injury can occur under these conditions and how it may be avoided if the surgeon is aware of the possible existence of these anomalies

**CASE I CALCULUS IN GALL-BLADDER; PARALLELISM OF CYSTIC AND HEPATIC DUCTS; CHOLECYSTECTOMY ACCIDENTAL LIGATION AND DIVISION OF HEPATIC DUCT; RECOGNITION OF INJURY AND END TO END SUTURE OF DIVIDED HEPATIC DUCT**

This lady is now seventy three years of age In April 1914 she came to me with the following history She was then sixty four years of age and had had 6 children the youngest being twenty years old She had never had typhoid fever She had been ill for about ten years suffering from indigestion accompanied by attacks of pain in the right hypochondrium vomiting and occasional jaundice She had lost considerable weight but had never passed any calculi in the stools On examination there was definite sensitiveness in the right hypochondriac region Her weight was 93 pounds

The characteristic history warranted the diagnosis of gall bladder disease probably cholelithiasis

On April 27 1914 I exposed the gall bladder through a right

Reg A h f kl Chir 1908 l lxxxv p 47

May Annal f Surg 190 l xl p 90

Koerte Arch f kl Ch 1909 l lxxxv p 1

K h Chir d Gall wege \ D tsch Ch 1913 l viii p

464

K h D Praxi d Gall g Chir u g 1913 l p 183

Eliot S g Gyn d Obst t 1918 l xxvi p 81

Eisendrath S g Gyn d Obst t 190 vol xxxv p 1

The patient's convalescence was relatively uneventful. For about a week there was a rather profuse drainage of bile although from the very beginning the stools were distinctly colored. The abdominal wound healed well and the biliary drainage gradually decreased until on the day of the patient's discharge from the hospital twenty six days after the operation it had practically ceased. Since that time she has been per-

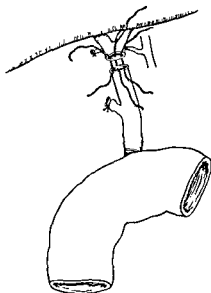


Fig 246—Lgt d h p t d t m d y t r r y p  
tly l g t d y t d c t l g t d d g l l b l d d m d E d t - e d  
t f d d d h p t d t b g u p o t l y

fectly well. There have been no attacks of pain, fever, or jaundice which would suggest a stenosis of the duct, and her gastric symptoms have entirely disappeared. As you see, for a woman of her years, she appears to be in excellent physical condition. She now weighs 132 pounds, having gained 39 pounds since her operation. A small ventral hernia is present in the scar at the point of drainage.



conditions responsible for this accident are well illustrated in the drawings (Figs 244-245) which show a parallelism of the cystic and hepatic ducts instead of the usual anular junction and illustrate how careful one should be in passing the ligature around the cystic artery. The cystic duct was next quickly freed and ligated and the gall bladder removed. The two cut ends of the hepatic duct were then exposed and it was seen that the point of division was just below the junction of the right and left ducts in fact the two openings could easily be seen and probed

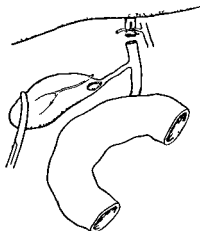


Fig 245—Case I. Ligature around cystic artery and hepatic duct with cystic artery divided and complete transverse division of hepatic duct.

Fortunately the duct was rather wide and its tissues were healthy so that it was not very difficult to approximate the two ends with interrupted sutures of fine catgut which were passed through the entire thickness of the duct. I began posteriorly as indicated in the illustration (Fig 246) and made a complete circular suture. Anteriorly I reinforced the suture line with a second row and covered the suture with omentum. A cigarette drain was placed lateral to the line of suture and a gauze tampon laid in the liver bed. The abdominal wound was closed in three layers in the usual fashion.

and were quite adherent to each other (Fig 247) The cystic duct was considerably dilated and thickened Some difficulty was experienced in separating these structures but this was finally accomplished without injury to the hepatic duct. During this procedure owing to its friability the gall bladder was opened and a large quantity of mucoid pus containing several small faceted stones was evacuated and swabbed out. The gall

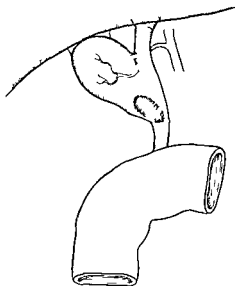


Fig 247—C II P II l m f g l l b l d d t h p t d c t L a g  
 l l k f g l l b l d d p t d g t m m o d t w t h p t l  
 b f y t d c t C m m d h p t d c t d l a t d

bladder was directly attached to the common duct there being no intervening cystic duct (Fig 248) and the large ovoid stone was impacted in its neck and protruded for quite a distance into the common duct

The gall bladder with the stone was removed by incising around the neck leaving a transverse opening in the common duct which as somewhat dilated (Fig 249) A sound was introduced up rd into the hepatic duct and downward into the

**CASE II DIRECT JUNCTION OF GALL-BLADDER WITH COMMON DUCT; LARGE CALCULUS PROTRUDING FROM REMNANT OF CYSTIC DUCT INTO COMMON DUCT; PARALLELISM OF GALL-BLADDER TO HEPATIC DUCT CHOLECYSTECTOMY WITH COMMON DUCT SUTURE**

This lady is forty-eight years old. She has had 3 children the youngest being twenty years of age. She has never had typhoid fever. For twelve years she suffered from indigestion with pain particularly after eating improper food. For the past few years these attacks were rather more severe in character and were accompanied by nausea and vomiting. The pain was usually located in the epigastrium and radiated to the back and shoulders. Her last attack began in the latter part of December 1922. On January 15, 1923 she had particularly severe pain and two days later she had a slight chill and some fever. She also vomited occasionally. During this attack she lost about 25 pounds in weight.

I saw the patient first on January 20, 1923. She was distinctly jaundiced although not intensely so and she was markedly sensitive in the right hypochondrium but there was no mass to be felt and no abdominal rigidity. Her temperature was 101° F. Her clinical history which in these cases is really the most important deciding factor pointed definitely to a chronic gall bladder condition which had become acute. There were signs of common duct obstruction probably due to a calculus and of an infectious process most likely in the gall bladder.

On January 22, 1923 I exposed the gall bladder through the usual right hypochondriac incision. It was found to be rather small much thickened and friable its serosa was injected and there were dense adhesions of the omentum to the fundus. Numerous small calculi were palpated in the gall bladder and one large ovoid stone the size of an olive was found at what appeared to be the junction of the common and cystic ducts. After separation of the adhesions from the fundus of the gall bladder a cholecystectomy was begun from above downward. The cystic vessels were ligated close to the gall bladder and it was then seen that the hepatic duct and gall bladder ran parallel

sutured portion of the wound you will note has healed by primary union. There is now merely a superficial granulating drainage sinus and the patient is almost ready to be discharged from the hospital.<sup>1</sup>

This case is of peculiar interest in comparison with the previous one as it shows how injury to the hepatic duct can be

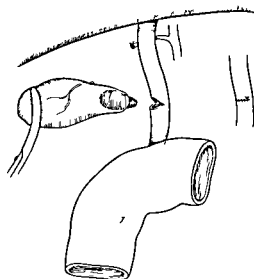


Fig 249—Case II. Removal of gall bladder and closure of common duct with peritoneum. Diagram showing the relation of the cystic duct to the common duct and the gall bladder.

avoided if the unusual relation of this duct to the gall bladder or cystic duct is recognized during the operation. It also shows that drainage of the hepatic duct is not always necessary in common duct obstruction and that the closure of the common duct after the removal of the obstruction may be performed with safety and a considerable hastening in the postoperative recovery.

The patient was discharged from the hospital on February 16, 1923, twenty-five days after the operation. The wound was perfectly healed. She was seen by me three months later. She was perfectly well and had gained 10 pounds weight since the operation.

common duct passing easily through the papilla and into the duodenum. No obstruction was noted although there was no biliary flow. This absence of bile did not surprise me as it is not an uncommon phenomenon in cases of common duct obstruction. It is due to an arrest of hepatic function and in mild not protracted cases is only temporary. Soon after the obstruction is relieved the bile secretion usually commences again. As there was no evidence of cholangitis in this case it was de-

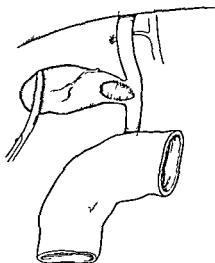


Fig 248—Case II Cystic duct ligated and divided and gallbladder separated from the patient.

cided that hepatic drainage was not necessary and the transverse incision in the common duct was sutured with continuous catgut.

The patient made an uneventful recovery from the operation and for one week drained considerable bile. This biliary drainage ceased on February 1st. The jaundice rapidly cleared and even the first stools after the operation were colored. The patient is entirely well and seems to be putting on weight. The

## CLINIC OF DR A R STEVENS

NEW YORK POLYCLINIC SCHOOL AND HOSPITAL

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### PROSTATIC OBSTRUCTION

It seems to be a common belief among practitioners that the familiar clinical picture of prostatic obstruction is always due to a gross hypertrophy of the prostate and that the only effective treatment is prostatectomy. Yet there are other types of obstruction which unfortunately are usually described as though they were conditions different from and unrelated to the common one (adenoma). However it must be remembered not only that there are many types of prostatic obstruction varying in form and pathology but also that each of these may cause the same typical group of symptoms—frequency of urination by night as well as by day, difficulty, hesitation and alteration of stream. And I want at the same time to emphasize the fact that there are minor as well as major procedures which afford entire relief in properly selected cases and that these minor procedures are at times valuable accessories to the major operations.

We should aim first to diagnose prostatic obstruction in general then to determine its form and pathology before deciding on the suitable remedy. We should regard all prostatic obstruction as mechanical obstruction *per se* which may be physically removed by various methods, the individual variation in type demanding corresponding intelligent variation in operative technic and the pathology will obviously influence the mode of attack. The urologist should acquaint himself with both of the classical types of prostatectomy (suprapubic and perineal) and also with the special methods which are efficient in dealing with certain cases of obstruction. Surely the time is quite passed for

ery This tendency I believe is gradually increasing and while I do not advocate it where there is a straightforward cholangitis I see no reason why it should not be practised in cases where there is no infection in the common hepatic or smaller bile-ducts

These 2 cases also illustrate the advantage of cholecystectomy from above downward It is readily conceivable that the accident experienced in the first case probably could not have been avoided in the second if the cholecystectomy had been begun with ligature of the cystic vessels and cystic duct

problem but remember that the effect on the act of urination is mechanical and removal of the obstructing portion of the prostate is necessary if normal urination is to be restored. The passage of urine through the natural channel must be given up for a permanent suprapubic opening. In these cases the pathology has great weight in influencing our decision concerning the therapy. Besides mechanical relief the possible cure of malignancy is to be considered. Radium has its exponents although some workers of considerable experience lack enthusiasm. But bear in mind that even with the advocates of radium the relief of obstruction is often a separate problem requiring the physical removal of an adequate amount of obstructing tissue at the vesical neck by mechanical means or by actual gross tissue destruction with radium through a suprapubic cystotomy wound. The future of deep therapy with the Roentgen ray seems to offer more hope but its use in malignancy of the prostate is a scarcely explored field. The possibility of a cure by radical complete surgical removal of the whole prostate gland and certain neighboring structures in selected cases of early malignancy cannot be discussed at this time. The frequency of incontinence following this operation is a deterrent.

The third type of gross enlargement commonly encountered is that due to acute inflammation. This may need medical and hygienic measures only to assist resolution and consequent relief of the obstruction but if an abscess be present surgical drainage is added.

In the group of obstructions due not to gross prostatic enlargement but to a relatively small bit of tissue at the vesical neck (so situated as to cause the maximum harm) accurate cystoscopic diagnosis may save the patient a major operation and often leads to extraordinary results from minor procedures. A very small pedunculated middle lobe without general enlargement a median bar of prostatic tissue a contracture of the vesical neck due to connective tissue or a cyst may produce symptoms and deleterious effects equal to those encountered in a case of general hypertrophy. These cases are diagnosed by painstaking study with various models of cystoscopes and



the surgeon to be satisfied with one method of operation for all prostatic obstructions. The patient's temperament, the presence of complications, local or general, the failure to secure satisfactory or complete data in a given case, the patient's social condition—these and other factors will influence us in deciding upon the course to be pursued.

In practice our first consideration is diagnosis. Are we really dealing with prostatic obstruction and if so what is the form and nature of it?

Little trouble should be experienced in ruling out urinary frequency with large amounts of urine passed at each voiding due to medical diseases because of the large volume of urine secreted. Also we must eliminate the cases of frequency with small amounts due to *increased irritability*, the result of inflammation of the genito-urinary tract of calculus or of tumor at the vesical neck. The absence of residual urine in the latter group is perhaps the most important differential sign.

Without discussing the question of how often prostatic growth will cause symptoms before residual urine is found, the fact remains that residual urine is the commonest finding in all types of prostatic obstruction with symptoms. Our chief errors in diagnosis concern their causes of residual urine, notably spinal cord disease and diverticulum of the bladder. The fault is often due to sheer neglect for the diagnosis is usually rendered clear if one will carefully apply the methods of differentiation—neurologic examination, lumbar puncture, cystoscopy and cystography.

Obstruction may be due to more or less general prostatic enlargement. The common types are adenoma, carcinoma and acute infection (including abscess). The first requires nothing short of prostatectomy (ally lobectomy) for complete relief and care should be exercised to remove as far as possible all adenomatous tissue to prevent recurrence of the original trouble. Where prostatectomy is not feasible because of organic disease or senility, partial relief may be afforded by less radical procedures.

The treatment of malignant disease is far from a settled

problem but remember that the effect on the act of urination is mechanical and removal of the obstructing portion of the prostate is necessary if normal urination is to be restored else passage of urine through the natural channel must be given up for a permanent suprapubic opening. In these cases the pathology has great weight in influencing our decision concerning the therapy. Besides mechanical relief the possible cure of malignancy is to be considered. Radium has its exponents although some workers of considerable experience lack enthusiasm. But bear in mind that even with the advocates of radium the relief of obstruction is often a separate problem requiring the physical removal of an adequate amount of obstructing tissue at the vesical neck by mechanical means or by actual gross tissue destruction with radium through a suprapubic cystotomy wound. The future of deep therapy with the Roentgen ray seems to offer more hope but its use in malignancy of the prostate is a scarcely explored field. The possibility of a cure by radical complete surgical removal of the whole prostate gland and certain neighboring structures in selected cases of early malignancy cannot be discussed at this time the frequency of incontinence following this operation is a deterrent.

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urethroscopes The vesical neck can be studied on the bladder side by right angle vision and on the urethral side by both right angle and direct vision Correct interpretation of these views is often difficult but will frequently give one a clear mental picture of the existing conditions Perhaps nowhere may one find a better illustration of the fundamental teaching in medicine that accurate diagnosis is the necessary basis of efficient therapy For in this group of obstructions it is amazing what tremendous relief is afforded by the removal of a very small bit of tissue

If the tissue to be excised will fit into the depression of the Young punch or some modification of the same this instrument provides a simple and adequate means of cure Generality has shown that even simple cutting through of the obstruction in certain cases gives relief and has devised a cutting blade to fit the sheath of the Young instrument. Cauterization by the high frequency current has proved satisfactory in selected cases Some surgeons know the difficulty of correctly interpreting the cystoscopic and urethroscopic views of the vesical neck prefer to explore all such cases suprapubically then to remove the obstructive tissue by scissors or knife or by some type of rongeur forceps or by the Young punch (which I have found very helpful after cystotomy and which can be accurately applied with suprapubic guidance and reapplied and used as often as may be necessary until the obstruction is removed)

The need for and the methods of determining a patient's fitness and the means for improving the same are equally applicable to all types of prostatic obstruction As these have been discussed by so many writers in recent years we will take for granted a knowledge of the value of clinical findings renal function tests and blood chemistry A word of caution is needed Far from decrying the value of laboratory tests I utilize them freely and persistently But one hears so great emphasis laid on this or that finding it seems necessary to continually call attention to the greater value of clinical observations Good surgeons who were competent observers obtained excellent results from prostatectomy before the present era of practical blood chemistry

The following brief case report illustrate some of the types of obstructions referred to and the treatment regarded as appropriate

**Case I** — A man sixty seven years old had noted some urinary frequency about four year. The frequency had increased rapidly the past few months prior to his first visit to my office then he got up six to eight times at night. There was difficulty in starting the flow and discomfort in the prostatic region no hematuria. Patient has never been catheterized.

*Examination* — General condition was excellent. Output of phthalein in two hours 40 per cent. Residual urine 190 and 250 c.c. on two occasions. Prostate felt by rectum was moderately enlarged, symmetric and typical of adenoma in consistence. Cystoscopy showed marked trabeculation of bladder wall and moderate enlargement of the prostate in the form of a collarette posteriorly with a fairly large lobe anteriorly.

Preliminary examinations were all satisfactory and perineal prostatectomy was performed by the Young technic. Two lateral lobes of moderate size were removed the anterior lobe came away with the left lateral lobe. A finger introduced into the urethra felt a large vesical neck with soft margins no median posterior obstruction and no anterior lobe.

All went well the first twelve days after operation and patient was out of bed and walking. Then without warning a moderately profuse hemorrhage occurred from the wound. There was no recurrence of bleeding and the subsequent course was uneventful. A record made five weeks after operation noted that the urinary control was good the interval by day was three to four hours and at night the patient had from seven to eight hours uninterrupted sleep. The flow was easy and there was neither difficulty nor urgency. Residual urine 8 c.c.

**Case II** — A man fifty nine years old had had great frequency of urination for about ten years. When he came under my observation he was voiding about twenty times a day and four times at night. Urgency and difficulty in starting the

flow were inconstant symptoms. He had had intermittent treatment for syphilis in the past eighteen years, the last three years of which had been especially for spinal cord involvement.

*Examination*—The reflexes were all active. No Romberg sign present. Residual urine varied from 50 to 100 c.c. The prostate was found to be uniformly much enlarged and protruding markedly into the rectal lumen with the consistence of adenoma. On cystoscopy and urethroscopy a lobe of prostate was found protruding into the urethra near the vesical neck, but there was very little intrusion of the prostate into the bladder. The bladder wall presented over much of its surface a fine trabeculation noted so often in spinal cord disease.

The case was referred back to the neurologist, but the latter on two occasions assured me that he felt convinced that the spinal cord condition was healed and believed it had not caused the urinary disturbance. He saw no need of a spinal puncture. Operation apparently offered a prospect of some relief and accordingly a perineal prostatectomy was done. Two lateral lobes of moderate size were easily enucleated. The palpation finger in the urethra revealed a tight vesical outlet with an elevation posteriorly. A Young's punch was introduced and several bites taken, after which the orifice seemed of normal size and non-obstructing. The convalescence was uneventful. Urine came from the wound for the last time on the eleventh day.

The frequency of urination was not improved after operation. During the following six or eight months the patient was seen occasionally. The residual urine varied from 5 to 150 c.c. Cysto-endoscopy showed a flat smooth floor at the vesico-urethral junction. Treatments of the prostatic urethra gave no real improvement. Obviously the spinal cord disease was the sole cause of the urinary complaints. The spinal fluid from lumbar puncture done subsequently gave positive Wassermann test.

*Case III*—This patient was fifty-eight years old. He had contracted syphilis fifteen years ago and been thoroughly treated.

The Wassermann has remained negative the past three years. There were no symptoms of spinal cord disease. Some urinary frequency had been noted for seven years and for a long time the patient had gotten up three to four times at night. During the two weeks prior to my first observation urination had been about every hour. Yet the patient's chief complaint was of a distended abdomen which he thought due to gas.

*Examination*—The man was slim and sallow but looked superficially in good health. Marked distention of the bladder was apparent to the eye and to the palpating hand. A catheter drew 725 c c of clear urine with specific gravity of 1005. A phenolsulphonephthalein test gave only a pink color not a measurable quantity of dye. The urea, uric acid and creatinin percentages in the blood were all near the upper limits of normal. The blood pressure was systolic 210 diastolic 150. Cystoscopy revealed marked trabeculation of the bladder. The views of the prostatic border were interpreted to mean two lateral lobes and a middle one projecting into the bladder lumen.

The patient was put on intermittent catheterization for nearly two weeks. The residual urine dropped to 440 c c but the specific gravity of the urine remained low. After this first two weeks an indwelling urethral catheter was employed and continued for about ten days. The specific gravity gradually rose to 1011 and total output of urine for twenty four hours dropped from 4000 to 2200 c c. The nitrogenous constituents of the blood remained about the same. Two phthalein tests were done two days apart and each gave only a good trace of color. The appetite was improved and sleep was sound and refreshing.

It was felt that we had gained sufficient from the preliminary treatment to warrant operation. Perineal prostatectomy was done under gas and oxygen anesthesia. After removal of the moderate sized lateral lobes a finer was introduced to the vesical neck. A pedunculated middle lobe which had escaped thus far was felt and was easily enucleated through the urethra by the palpating finger.

The patient had hiccups off and on for five to six days after

operation otherwise convalescence was uneventful during the stay in hospital—a little over three weeks. The phthalein test done eight weeks after operation gave 25 per cent in two hours blood pressure systolic 110 residual urine a few cubic centimeters. The patient voided normally as much as 450 c.c. at a time with a good stream. A year after operation the patient could sleep six to eight hours without arising to urinate and voided at intervals of two to four hours in the day residual urine was 5 to 10 c.c. phthalein 12 per cent in two hours.

When prostatic obstruction is due to or is a part of general benign enlargement a general prostatectomy (lobectomy) is indicated. The perineal operation is technically more difficult than the suprapubic but the convalescence is more comfortable for the patient and the mortality of the perineal route in competent hands is certainly a little lower than that of the suprapubic route employed by skilful surgeons. In addition the suprapubic operation is followed by ventral hernia in a certain number of cases. Hence my attitude is always in favor of the perineal route unless there be present some such specific reasons as those to be mentioned for making a suprapubic opening. Some patients will not tolerate an intra urethral catheter and suprapubic drainage is necessary in the preliminary preparation for operation. In other instances cystoscopy is not satisfactory and direct visual examination of the vesical neck is desirable. Then of course the trouble may be dealt with in the manner best adapted to the particular case. Cystoscopy may reveal a tumor a diverticulum or large calculus of the bladder conditions that obviously should be approached from above. A large middle lobe is also more easily handled suprapubically.

The two chief objections to perineal prostatectomy are the occasional lack of complete control following operation and the occasional injury to the rectal wall. Incompleteness of control of urination is most often due to injury of the external sphincter. I have more and more sought to a good thus muscle and accordingly have made the incision in the urethra further and further away from (posterior to) that muscle and now frankly ut

into the urethra through the apex of the prostate instead of the membranous urethra. Regarding the possibility of rectal injury in most cases the dissection between urethra and rectum on either side of the midline is easy but trouble is sometimes encountered in the midline because the rectal wall is held close to the urethra by the rectourethralis muscle. This muscle can usually be recognized and cut under visual control but if there be any doubt as to the location of the rectal wall do not hesitate to locate it by placing a finger in the rectum.

The 3 cases cited thus far were chosen to emphasize the importance of forestalling later trouble by examining the vesical neck with a finger after the perineal prostatectomy is completed. In the first instance a soft smooth regular large opening was found. In the second a rigid tight orifice was palpated. The situation was splendidly handled by the Young punch several pieces of fibrous tissue were removed leaving a large free opening. In the third instance a small pedunculated lobe was felt and easily removed by the palpating finger. This could easily have vitiated the result and led to the necessity of another operation.

The second case was purposely selected not only for the reason named above but to warn against operating on the prostate in the presence of a cord lesion. I had suspected this pitfall but was urged to operate in the hope that prostatic obstruction was the chief cause of the urinary complaint.

**Case IV**—A man sixty years old was seen in great distress. He was voiding every few minutes and had a bladder visibly distended to the umbilicus. For six or eight months he had been getting up several times at night. For six weeks the frequency had gotten rapidly worse and for four days the patient had been straining with very frequent urination of small amounts and had suffered much pain from the distended bladder and from hemorrhoids. He was markedly constipated and the general condition very poor.

*Examination*—The patient was very thin weak and pale



and looked much older than his years. His teeth were very bad many had been recently extracted. Catheterization brought 660 c c of very foul urine. The prostate was much enlarged rounded with median furrow obliterated elastic and protruded markedly into the rectal lumen. Clinically it was an adenoma with no signs of malignancy.

Intermittent catheterization was employed for two days while arrangements were being made. Then under local anesthesia suprapubic cystostomy was done. The blood at this time showed a marked secondary anemia with hemoglobin 46 per cent the total non protein nitrogen was 185 mg per 100 c c of blood the blood urea 222 creatinin 1.8 uric acid 4.7. The phthalein output for two hours was 14 per cent two days after cystostomy and but 15 per cent six days after operation. On the day of the last phthalein test the blood urea was 183.

The wound was kept clean and the patient was perfectly comfortable wearing the suprapubic tube but the condition far from satisfactory and after ten days in the hospital the patient was sent off to the country with a trained nurse. On his return in two months the phthalein output for two hours had risen to 58 per cent and the urea in the blood was 41 mg per 100 c c. The patient's color was excellent and he had gained 30 pounds.

The usual custom in the so-called two-stage prostatectomy is to enlarge the cystostomy wound and remove the prostate through it. In this case as the sinus was so clean and the surrounding tissues free from inflammation I dissected out the tract to the bladder then enucleated the prostate by the familiar technique using on the roof of the urethra. The two lateral lobes and the moderately large middle one were removed in one piece. There was no excessive bleeding.

The postoperative course was uneventful. The last bit of leakage of urine from the wound was on the twenty second day after operation. Four weeks after operation the patient was voiding with ease as much as 300 c c at a time. Residual urine was 10 c c.

*In Case IV the opening made in the bladder to afford the needed drainage and the lack of an early cystoscopy offered a double argument for a suprapubic prostatectomy and the incidental exploration of the bladder thus made possible. Perineal prostatectomy has been done after preliminary suprapubic drainage but I believe this is pushing one's enthusiasm for the perineal approach too far as a routine measure.*

The following case report illustrates another reason for a suprapubic approach a reason which the best cystoscopists readily admit is not infrequent. Even after instrumental examination we did not feel sure that operation through the urethra would be effective and in this case it was most desirable for temperamental reasons not to take chances but to be sure of a prompt result. However from direct observation of the vesical neck through the suprapubic wound it was obvious that the punch would do the job better than rongeur knife or scissors particularly with the perfect control afforded by vision and touch through the opening in the bladder.

Case V—This man was forty two years old when first seen by me. He had had many attacks of gonorrhea. He complained to his doctor of pains weakness and stiffness of the thighs and calves. Wassermann reactions were negative and spinal fluid normal. Stricture was diagnosed and treated with great relief of the leg symptoms. Frequency of urination was not noted until the doctor began urethral instrumentation three to four months before I first saw the patient. At the time of our first meeting the patient was voiding about every two hours by day and two to five times at night. There were found several strictures of the penile and bulbous urethra which could be ultimately dilated with difficulty to F 30. Residual urine varied from 35 to 45 cc on different occasions. Study of the vesical neck through the McCarthy cysto-endoscope showed a smooth prostatic border without intravesical lobes a slight falling away of the posterior bladder floor above the prostate and a deep depression of the floor of the posterior urethra just in front of the vesical neck.

I was in doubt whether the opening in the Young punch was long enough to grasp the obstructing bar and hence preferred suprapubic exploration and the opportunity to remove the obstructing tissues completely. At operation an internal urethrotomy was first done to help the subsequent passage of instruments. After a suprapubic opening was made a tight bladder outlet was found. The punch instrument operated through the urethra met the requirements perfectly. Several pieces of tissue were removed leaving a large opening with the floor of the bladder the vesical neck the posterior urethra on the same plane. The convalescence was satisfactory the last urine coming from the wound on the eleventh day and the patient left the hospital on the nineteenth day. Subsequently the residual urine was nil and the patient voided normal amounts at normal intervals and with an ease not known for several years.

I have had similar cases of prostatic obstruction due to a median bar or contracted vesical neck with no general prostatic enlargement but with residual urine and the usual clinical picture common to all obstruction in which the cystoscopic diagnosis was satisfactory and the width of the obstruction (as measured by manipulation of the cystoscope) known to be not too great for the Young punch. These types have been well handled by this method and in well over twenty five such operations I have not had an alarming hemorrhage. It seems unnecessary to take time to give illustrative case reports.

But I should like to add the case report of a man who had had three so-called prostatectomies who obviously had had his fill of operations but who still had frequency and residual urine due to the prostatic tissue remaining. He was made more comfortable with a reduction of residual urine by the removal of certain tissue by cauterization with the high frequency current. This is a method of mechanical removal of obstructions which one should know although its field of application is probably not large. I reported ten years ago (*New York Medical Journal* July 26 1913) complete relief of symptoms in

men having large amounts of residual urine due respectively to contracted vesical neck and to a middle lobe. The method is feasible only with patients who tolerate the cystoscope well and useful in those who refuse operation or who still have trouble after operation as in the following instance

Case VI—This patient seventy four years old had had a perineal prostatectomy ten years before he was referred to me suprapubic prostatectomy eight years before and another perineal prostatectomy six years before. He was voiding from 3 to 6 ounces of urine at a time and at intervals of from one to three hours he occasionally dribbled a little especially at night. The residual urine had been tested frequently and varied from 2 to 4 ounces. Cystoscopy revealed an irregular prostatic border as is found in nearly all cases after prostatectomy with a large nubbins in the left posterior aspect which would seem to be in position to fall over the vesical outlet during urination. On partial withdrawal of the cystoscope a median bar came into view. The man stood instrumentation particularly well and was very desirous to secure some measure of relief. I treated him six or eight times in three months not doing too much each time. No particular discomfort and no bleeding followed the treatments except for the fact that epididymitis did follow one of the later treatments. This however subsided quickly. A decrease of residual urine to 2 ounce and improvement of symptoms followed quickly. But the real interest centers in the late results. Observation two and one half years later showed residual urine less than an ounce and the amounts voided varied from 6 to 9 ounces with a corresponding increase of intervals. The improvement as reported is not striking but the increased comfort and better sleep afforded made the prolonged treatment worth while to the old gentleman.

My aim has been to point out the similarity of symptoms resulting from the various types of prostatic obstruction regardless of the pathologic change. Besides rectal palpation careful study of the vesical neck by cystoscopic methods is necessary to

afford full knowledge of the lesion its form and its pathology. And only with this knowledge can we select the proper method of affording relief. Prostatectomy by either of the usual methods is not only uncalled for but will likely do no good in cases of contracture of the vesical neck. Yet with general adenomatous enlargement removal of only the most obviously obstructing part (e. g. a middle lobe) will probably afford only temporary relief a general prostatectomy is indicated. We must realize the necessity of leaving the vesical neck clear and large for it is here that a small bit of tissue will do the maximum harm. If the trouble be only here (without general prostatic enlargement) the simpler methods applied through the urethra or through a suprapubic opening afford perfect results. Also although general enlargement is evident and requires prostatectomy it is important to investigate the bladder neck distally after the lobes have been removed to be sure that a small amount of tissue does not still remain to vitiate the final result. The occasional use of certain minor procedures with prostatectomy or their subsequent employment to improve an unsatisfactory outcome from prostatectomy will add materially to the ultimate comfort of the patients.

## CLINIC OF DR JOHN F CONNORS

### HARLEM HOSPITAL

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#### GUNSHOT WOUND OF THE ABDOMEN

THE first patient for this afternoon's clinic was brought to the hospital by the ambulance having been shot twice one bullet entering the body in the midaxillary line at the level of the tenth rib the other entering the upper left quadrant No history was obtained as the patient was unable to speak English

**Physical Examination**—Patient is an adult white male about thirty five years old well nourished appears acutely ill presenting the signs of shock and hemorrhage The abdomen is rigid and tender throughout the maximum point of tenderness being over the left upper quadrant A shifting tympanic note on percussion is indicative of fluid in the abdominal cavity

**Laboratory Findings**—Urine is negative

**Blood Count**—Leukocytes 18 200 polynuclears 81 per cent lymphocytes 19 per cent hemoglobin 74 per cent

**Remarks**—The patient was observed for two and a half hours before operation Within this time the general condition was slightly improved having responded to the routine treatment for shock The blood count and decrease in the percentage of hemoglobin were indicative of hemorrhage and operation was decided upon

**Tentative Diagnosis**—Penetrating wound of the abdomen involving gut and spleen and possible injury to the left kidney The urinary findings were against the last condition The diagnosis was fixed at by inspecting the wounds The direction of the bullets was obliquely downward and inward for the one and slightly downward and across for the other

**Operation**—A transverse incision is made at about the level

of the two bullet wounds. On opening the peritoneal cavity free blood is present. Immediate evisceration of the small gut is now brought about. A rent in the mesentery is found which is bleeding profusely and which is ligated with a through and through suture. Three other perforations in the mesentery are treated in a like manner. Eleven perforations of the intestine are found which are inverted with a simple catgut suture (00 chromic). The suture included the serous and muscular coats of the intestine. On further examination a through and through perforation of the spleen is revealed fortunately escaping the blood vessels at the hilus. The left kidney is torn in several places and is surrounded by a large retroperitoneal hematoma. There is a tear of the liver to the left of the fissure of the gall bladder which extends from the inferior to the superior surface. The tear is tightly packed with iodoform gauze; no suture is taken as there are no signs of liver hemorrhage. A large pad is placed in the region of the left kidney and the spleen with the idea of controlling any capillary oozing which might subsequently arise in this region. The packing is removed from the liver and as there is no further bleeding the rent is not sutured or repacked. A counterincision is now made above the pubes through which a cigarette drain is inserted. The abdomen is closed in layers.

In discussing this operation several important questions arise:

- 1 Bullet wound
- 2 Speed of operation
- 3 Incision
- 4 Evisceration
- 5 Treatment of intestinal perforations
- 6 Treatment of visceral injury other than gastro-intestinal
- 7 Drainage

1 *Bullet Wound*—Careful inspection of the bullet wound gives the direction taken by the missile and whether it is one of entry or exit. The location of the incision is in part governed by this. Visceral injury can at least be tentatively diagnosed regardless of the presenting symptoms and signs. Where there

are several wounds it is of great importance to know how many of these are of entry and exit. A concentric area of contusion and abrasion indicates that the bullet has taken a straight course (Fig 250). If the area of contusion and abrasion occurs in a segment of the edge of the wound the area involved determines the direction of the bullet (Fig 250 B to I). The opposite side of the contused area is always undermined. The under

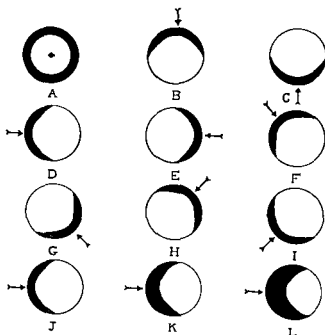


Fig 250—Arr w d t d ct tak by m ssil

minin increases with the degree of obliquity (Fig 250 J to L). The point of entrance is usually smaller than the caliber of the bullet. This varies with the different parts of the body depending upon the elasticity of the skin and subcutaneous tissues. The type of the wound of exit varies considerably depending upon several factors (deformed bullet foreign bodies clothing bone etc). No area of abrasion is found.



2 *Speed of Operation*—This is one of the most important points in gunshot wounds of the abdomen. In few other conditions is the necessity of quickly entering and leaving the abdomen so essential. One must boldly and rapidly inspect and palpate the stomach and intestine and remaining viscera for injury with immediate repair as the various lesions are revealed.

3 *Incision*—In the past few years a transverse incision (Sprenkel) has been employed in this clinic for various pathologic conditions in the abdomen. The ease with which the presenting pathology becomes accessible makes this incision a desirable one and should therefore be more frequently used. Just recently it has been employed in several traumatic abdomens with great success. If a greater exposure is necessary the incision can be carried across to the other side or a vertical incision up or down can be added. The location of the incision depends upon the bullet wounds as stated above. No postoperative hernias have been observed in the return clinics of the past few years. In this particular instance the incision was most ideal as all the viscera could be inspected and palpated.

4 *Evisceration*—This method has been employed as a routine procedure in all penetrating wounds of the abdomen at this clinic for some time. Numerous objections have been raised, the only one of consequence being the slight added shock of immediate total evisceration which is not sufficient to condemn it. The other method of gently pulling out of the gut loop by loop and returning the same probably produces as much shock. Furthermore there is greater soiling and necessarily more handling of gut surface. Evisceration has the following points in its favor. That immediately after opening the abdominal cavity the perforations become extraperitoneal. The intra-peritoneal soiling from the perforations of the small intestine is avoided. Inspection, palpation and returning of the gut is greatly facilitated. The root of the mesentery can be thoroughly examined likewise the remaining intra-abdominal viscera.

5 *Treatment of Intestinal Perforation*—Layer suture is employed as it adds to the tumefaction. All that is required

1 a simple whip over or a modified purse string suture (Fig 251)

6 *Treatment of Visceral Injury Other than Gastro intestinal* — Kidney injury is usually associated with a retroperitoneal hematoma. In most cases the hemorrhage is self limited. Opening the blood clot makes an ideal pabulum for bacteria and the much sought for bleeding point as a rule is not discovered and is therefore not recommended. Spleen injury. If the vessels of the hilus are injured or if the spleen is severely lacerated it is to be removed. Liver injury. A small rent is

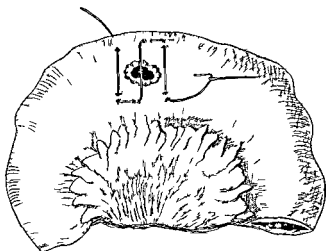


Fig 251—*Illustration of the method of repair*

treated by light packing with iodoform gauze. If the hemorrhage is severe the rent is repaired with a mattress suture using a blunt non-cutting needle. No traction or unnecessary pulling of suture is employed and very little tension is made in tying the suture. Larger rents are treated in the same way, hemorrhage being the indication for suture. Iodoform gauze is preferable to plain gauze as the former has greater hemostatic action.

7 *Drainage* — Pelvic and situ drainage are used in all cases six hours after injury and earlier if some special indication arises.

*Postoperative Course and Treatment* — The patient's tem

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5 *Treatment of Intestinal Perforation*—Layer suture is not employed as it adds to the time element. All that is required

## ARTERIOVENOUS ANEURYSM OF THE RADIAL ARTERY

THIS patient came to the hospital complaining of a painful swollen mass on the right forearm

**Previous History** —Irrelevant to present condition

**Present History** —Dates back two months prior to admission to the hospital at which time patient sustained several severe cuts on the right forearm following the breaking of a taxicab windshield. These lacerations were sutured by a physician. Two weeks later the patient noticed a small localized swelling at the site of the previous injury which she attributed to a piece of glass being left in the wound. This swelling gradually became larger and more painful. On date of admission patient first applied for treatment in the accident ward. The intern in charge on ascertaining the history of pain and swelling made preparations for the incision and drainage of an abscess of the forearm. Fortunately just before incising supposed abscess he noticed an expansile pulsation. He then admitted the patient to the hospital. This illustrates the importance of always making a thorough examination.

**Physical Examination** —The patient is an adult female colored about twenty five years of age well nourished and apparently in good health. Further examination is negative except for several healed lacerations of the right forearm and a small pulsating mass 4 by 2½ cm in size on the anterior surface of the right forearm midway between the elbow and wrist. There are no signs of inflammation. The radial pulses when taken are apparently equal. The mass disappears in part when pressure is applied proximally and distally to it. Expansile pulsation is present. On auscultation a bruit is heard.

**Tentative Diagnosis** —Arteriovenous aneurysm of the radial artery

**Operation** —An incision is made over the mass. A sac

perature varied from 99 to 103 F for the first week. From then on to the time of discharge it varied from 99 to 101 F. Pulse registered from 90 to 140 for the first week and after that from 90 to 110. Routine shock treatment was instituted for the first forty-eight hours after which it was changed to treatment for peritoneal irritation and mechanical ileus. Two days postoperatively the patient developed signs of a true mechanical obstruction: intermittent colicky pains, vomiting, obstipation and distention. In looking for the cause of the obstruction the possibility of the laparotomy pad left in the abdomen acting as a tumor pressing from without on the lumen of the gut was considered. This contention proved correct. The pad was removed, the pain ceased and soon after a good result followed a colonic irrigation. The wound showed signs of infection of the sixth day and persisted until the time the patient left the hospital. The patient was ordered out of bed on the eleventh day. On the thirty-third day the patient left the hospital contrary to the advice of the attending surgeon and has not returned to the follow up clinic.

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Fig 253—V ped po g th t i l to wh h h be  
t d

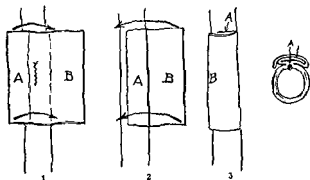


Fig 254—1 S t r m p l t d 2 n w f l p A p l d o v e t h e t e  
l n 3 w d f l p f l d d w f l p 4 o s s - s e c t f p e r a t  
c o m p l t d

inserted and four silk worm gut sutures are used to close the incision



presents itself which is dissected free. The artery and vein are exposed for some distance above and below the mass. A clamp is applied on the artery above its connection with the vein. Tributaries to the vein are ligated. The vein is now ligated above and below the sac and this sac is incised longitudinally in such a way as to make a narrow and a wide flap (Fig. 252). The arterial clamp is momentarily released and a

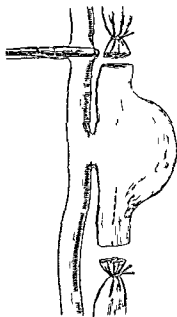


Fig. 252—Clamp applied to artery and vein ligated above and below the connection and then longitudinally incised.

spurt of blood is noticed. The clamp is reapplied. The opening in the artery is exposed and sutured (Fig. 253). The clamp is again released and as no bleeding occurred the narrow flap A (Fig. 254) is placed over the sutured arterial incision. The wide flap B (Fig. 254) is now folded over the narrow flap A and a layer of fascia in turn is placed over this flap and held in this position by two sutures. Silkworm gut drainage is



Fig 23—v pe d p g th rt ial t wh h h bee  
t d

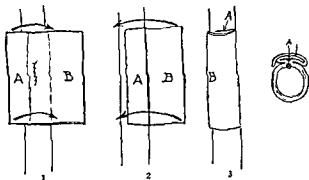


Fig 254—1 S t mpl t d 2 narr w flap A placed th t  
lin 3 wd fl p f ld d w fl p 4 s-sect f perat  
compl t d

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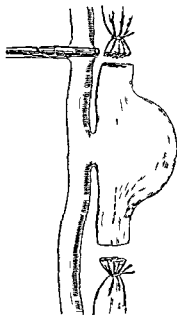


Fig. 252—Clamp applied to artery distal to the ligation above and below the connection distal to the ligation distal to the

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## RUPTURED APPENDIX WITH GENERAL PERITONITIS SIMULATING RUPTURED GASTRIC ULCER

THIS patient was brought to the hospital by the ambulance complaining of severe pain in the abdomen

**Previous History**—Scarlet fever diphtheria and typhoid as a child Brazilian climatic fever during adolescence also malaria Gonorrhea and syphilis acquired during this period General health is good

**Present Illness**—Two days prior to admission to the hospital the patient was seized with a severe pain in the epigastric region while sitting at the dinner table Shortly afterward he vomited copiously which relieved him somewhat The pain has continued and has increased in severity and he has vomited several times since At present the pain is general throughout the abdomen The bowels have not moved since onset The patient also complains of inability to pass urine On catheterization 5 ounces were obtained

**Physical Examination**—The patient is an adult white male about fifty nine years of age well nourished and appears acutely ill The abdomen reveals a board like rigidity and generalized tenderness throughout with maximum point of tenderness in the epigastric region

**Laboratory Findings**—Urine negative

**Blood Count**—Leukocytes 5600 polynuclears 69 per cent lymphocytes 31 per cent

**Tentative Diagnosis**—Ruptured gastric ulcer

**Operation**—A high right rectus incision is made Free seropurulent fluid exudes as the abdomen is opened There are no free gastric contents in the peritoneal cavity Exploration of the stomach and duodenum is negative The incision is now extended downward below the level of the umbilicus The small intestine is distended and congested throughout The appendix is now palpated It is found to be freely movable

In discussing this operation the question arises whether the operation just described has an advantage over the ligation of the artery and vein above and below the aneurysmal sac. Since the coats of the artery and the vein in this instance were not markedly damaged and the isolation of the sac was comparatively simple this method of procedure was chosen. There is no doubt that the collateral circulation would have been re-established had a ligation of the artery and vein been performed. However as a conservative measure it bears further trial as the artery and vein may still be ligated at any time during the operation or subsequently if the occasion arises.

Postoperatively this patient made an uneventful recovery.

## ACUTE HEMORRHAGIC PANCREATITIS SIMULATING HIGH JEJUNAL OBSTRUCTION

THE last case for this afternoon's clinic was admitted to the hospital several hours ago complaining of pain in the epigastric region and vomiting

**Previous History**—Usual diseases of childhood Menstrual history is negative

**Previous Surgical History**—At the age of five years the patient's back was broken

**Gastro intestinal**—Appetite is good except for the complaint of eructations of gas after eating For the past few years patient has had occasional griping pains after partaking of food There was no time relationship between the pain and food intake In the past few months these attacks have increased and have occurred mostly at night The localization of the pain has always been in the epigastric region No history of vomiting during these attacks The bowels are irregularly constipated and as a rule considerable straining is necessary before evacuation occurs Patient has never noticed any blood in the vomitus or stool

**Present Illness**—About thirty hours before admission the patient was seized with severe colicky pains in the epigastric region which radiated to the left and up into the thorax This pain has continued since as a dull ache with acute exacerbations With the onset of pain the patient vomited This persisted for several hours and later occurred when the severity of the pain increased The bowels moved soon after onset of pain but have not moved since Several enemata returned clear The abdomen gradually became distended The patient also complained of intermittent attacks of dyspnea

**Physical Examination**—The patient is an adult white female about thirty two years of age fairly well nourished and appears acutely ill There is a slight cyanosis of the lips The respira-

swollen and points toward the spleen. On delivery the appendix is gangrenous throughout and ruptured at the tip. Several fecal concretions are felt within its lumen. Usual operation for removal of the appendix is performed. A cigarette drain is placed in Morrison's pouch and another is placed over the site of the appendix. A soft rubber tube is inserted in the pelvis. Routine closure of the abdomen.

In discussing the case just presented the diagnosis is the all important factor. Preoperatively ruptured gastric ulcer was the only lesion considered. One of the points against ruptured gastric ulcer was the absence of a previous history of gastric disturbances. This however has been observed in several other cases. The pain which in the beginning was severe enough for ruptured gastric ulcer became less severe and then gradually increased. Usually the pain remains severe and lessens only after the patient becomes moribund. The board-like rigidity is characteristic. The blood count indicates a lowered resistance. Tenderness over McBurney's point was no greater than over any other part of the abdomen except in the epigastric region which further favored the diagnosis of ruptured gastric ulcer.

**Postoperative Course**—Temperature remained 102° F. for four days when it gradually returned to normal. The pulse never exceeded 110. The routine treatment for peritonitis and postoperative ileus was instituted. After a very stormy convalescence the patient recovered despite the fact that an unfavorable prognosis was given postoperatively.

**Comment**—There were absolutely no symptoms seen in a carefully elicited postoperative history which indicated that the appendix was responsible for the syndrome presented.

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**Gastro intestinal**—Appetite is good except for the complaint of eructations of gas after eating. For the past few years patient has had occasional griping pains after partaking of food. There was no time relationship between the pain and food intake. In the past few months these attacks have increased and have occurred mostly at night. The localization of the pain has always been in the epigastric region. No history of vomiting during these attacks. The bowels are irregularly constipated and as a rule considerable straining is necessary before evacuation occurs. Patient has never noticed any blood in the vomitus or stool.

**Present Illness**—About thirty hours before admission the patient was seized with severe colicky pains in the epigastric region which radiated to the left and up into the thorax. This pain has continued since as a dull ache with acute exacerbations. With the onset of pain the patient vomited. This persisted for several hours and later occurred when the severity of the pain increased. The bowels moved soon after onset of pain but have not moved since. Several enemata returned clear. The abdomen gradually became distended. The patient also complained of intermittent attacks of dyspnea.

**Physical Examination**—The patient is an adult white female about thirty-two years of age, fairly well nourished and appears acutely ill. There is a slight cyanosis of the lips. The respira-

tions are increased and slightly labored. This can be accounted for by the kyphosis and scoliosis which exist as the heart and lungs are negative. On inspection the abdomen shows distention which is verified by percussion. There is slight tenderness and rigidity over the entire abdomen and signs of fluid are evident. There are no masses palpable.

**Laboratory Findings**—Urine: albumin and casts present; phenol and indican negative.

**Blood Count**—Leukocytes 24,100; polynuclears 92 per cent; lymphocytes 8 per cent.

**Tentative Diagnosis**—Acute intestinal obstruction.

**Operation**—A median incision is made. On opening the peritoneal cavity a serosanguineous fluid escapes. The omentum is present in the operative field and is studded with numerous dull white patches. A small piece of omentum was removed for microscopic purposes. On further exploration the intestine is found to be distended and constricted throughout and covered with small white patches. There is no evidence of a mechanical obstruction. The appendix and gall bladder are normal. There are no signs of ulceration of the stomach or duodenum. The pancreas is swollen and indurated. Two cigarette drains are inserted and a soft rubber tube is placed in the pelvis. Routine closure.

The interest in this case is from the diagnostic standpoint. The diagnosis of a hemorrhagic pancreatitis was suggested by the house surgeon, Dr. Alfred Cassasa, who based his diagnosis preoperatively upon the slight cyanosis which existed. At that time the cyanosis was attributed to the patient's physical deformity by other members of the staff. The classical pain of acute hemorrhagic pancreatitis which is supposed to be even more severe than that of acute ruptured gastric ulcer is absent. In favor of the diagnosis of high acute intestinal obstruction there is a history of cramp-like intermittent pain, vomiting and obstipation. The distention favored both conditions.

Reviewing the case after operation the diagnosis of acute hemorrhagic pancreatitis with the clinical syndrome as was presented should have been included in the tentative diagnosis.

The similarity between high intestinal obstruction and acute hemorrhagic pancreatitis has been recognized clinically for some time. Some years ago Sweet et al<sup>1</sup> experimentally showed the close relationship between the two conditions. Dr Eisberg, one of my assistants at the hospital, has confirmed in part the previous work of Sweet et al. Just recently he (Eisberg) has shown that an associated pancreatitis with a high intestinal obstruction experimentally produced increases the severity of the intestinal obstruction toxemia. Furthermore when the pancreas was excised the symptoms of high obstruction were less pronounced.

**Postoperative Course and Treatment**—Fluids were administered freely. Numerous high colonic irrigations were given but with poor results. Gastric lavage was resorted to for persistent vomiting. The pain continued but to a less degree. Pituitrin in divided doses and cathartics were given. Attacks of dyspnea occurred. Three days after operation patient succumbed during a convulsion.

Wound inspection postmortem showed the same pathology as found at the time of operation with the exception of the increased pancreatic activity within the peritoneal cavity.

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M D N mbe 1922 with publication



## CLINIC OF DR. FREDERIC W. BANCROFT

NEW YORK HOSPITAL

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### THREE CASES OF BILATERAL TUMORS OF THE OVARY

Case I Bilateral Papillary Cystadenoma of the Ovary

Case II Bilateral Edema or Elephantiasis of the Ovary

Case III Bilateral Dermoid Cysts

THREE cases are presented because they show the tendency of tumors of the ovary to be bilateral and the necessity therefore in certain types of ovarian tumors to perform a double oophorectomy.

**Case I**—A girl twenty years of age admitted to the New York Hospital Second Surgical Division on September 18, 1922.

*Chief Complaint*—Swelling in the abdomen for four years. Patient has noticed this mass in her abdomen for four years but during the last two weeks it has increased rapidly in size. She has had indefinite pain in her abdomen and back. Her menses began at fourteen years were regular every twenty-eight days and lasted for four days. No pain. Gastrointestinal. Occasionally vomits and for the last two weeks has suffered from diarrhea.

*Physical Examination*—A large cystic tumor which extended well above the umbilicus was revealed. The tumor has a depression in the median line so that it feels almost as if it were bilateral. It does not move with respiration. There is tympany in the flanks and none anteriorly. The vaginal examination shows normal size uterus anteverted, no bulging in the lateral fornices.

Double cystic congenital kidney was ruled out by the aid of cystoscopy and fluoroscopy. A barium enema reveals the colon normal in every way except that it is pushed out on both

right and left sides by some mass. The transverse colon is high for the patient's habitus.

*Operation* (September 23, 1927).—A large ovarian tumor extending way up in the left intercostal region was removed through an excision extending from the pubis to about 3 inches above the umbilicus. The tumor was removed without aspiration.



Fig. 255.—Laparotomy specimen of papillary cystadenoma.

tion, it was thought possible that there might be a malignant intracystic papilloma. It is well known that if these cells are aspirated, implantation metastases may occur through leakage of the fluid. The tumor was then given to the pathologist, who found that it contained a papillary cystadenoma.

The other ovary was apparently normal in size and appearance. We know that papillary cystadenomas are apt to be

bilateral and study of our previous cases has shown that as a rule these growths occur in the other ovary and a second operation is usually necessary. For this reason the other ovary was removed although it appeared normal and the woman was only twenty years of age. Upon examination in the pathologic laboratory the normal appearing ovary was found to contain a small papillary cystadenoma about 1 cm in diameter close to the surface of one pole.



Fig. 256—High power view of the small papillary cystadenoma of the normal appearing ovary.

Figure 255 shows a low power section of the tumor mass in the normal appearing ovary. Figure 256 shows a high power view of the mass in the normal appearing ovary while Fig. 257 reveals the structure in the large papillary cystadenoma.

This case shows the absolute necessity of removing both ovaries even in young women with this type of tumor. It also shows the advisability of always removing as far as possible an ovarian cyst without previous aspiration.



Case II—Bilateral edema or elephantiasis of the ovaries  
Twisted pedicle on the right side

Patient J L age twenty one married admitted to the  
Second Surgical Division New York Hospital September 22  
1922

*Chief Complaint*—Pain in the lower abdomen for twelve  
years



Fig. 257—High power view of papillary cystic degeneration of large tumor

*Present Illness*—When in bed this morning the patient was seized with acute stabbing pain in her right lower quadrant. This was not constant, was ramp-like, coming and going momentarily. The pain radiates into the lumbar region. Patient has been spotting irregularly from the vagina for 6 months. Periods have always been irregular since their onset at eleven years of age. Patient has omitted twice since the onset of the present illness. The bowels moved today.

*Past History*—Negative except that her periods have always

been irregular coming every twenty to ninety days. The flow varies from one day to two weeks. She thinks that her last regular period was two months ago in spite of the irregular spotting that has occurred for five months.

*Physical Examination*—General examination negative. The abdomen shows moderate tenderness and deep palpation low down in the right side. Vaginal examination. The cervix is soft. The external os is patulous. The fundus is pushed posteriorly by a tumor mass apparently the size of a lemon which is anterior

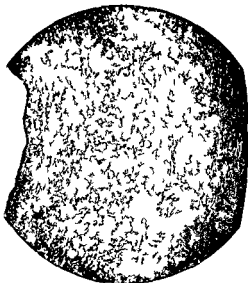


Fig. 258.—High power view (case N. 256)

and to the right. This is excessively tender on palpation. The white blood count is 12,000 with 86 per cent polynuclears. The temperature on admission was 100.4 F.

On account of the sudden onset of pain, the irregular menstrual history with spotting, the rather soft cystic, freely movable mass, diagnosis of unruptured ectopic gestation was made and an immediate laparotomy performed.

The right ovary was found to be a large solid mass about 8 cm. in diameter with a somewhat glistening surface and with

the pedicle twisted three times causing marked constriction. The ovary was excised, split open and inspected. It was found to be solid on gross section and with a peculiar mucoid consistency. The left ovary was then inspected and found to be enlarged about four times the normal size and apparently involved with the same pathology as the right. There were several corpus luteum cysts in the mass so that it was felt that all active ovarian tissue had not been destroyed by a tumor

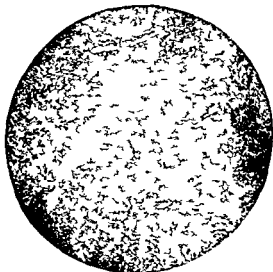


Fig. 259.—Showing marked edema of the ovarian stroma and the presence of granular follicles.

growth. Although it was a difficult operation, it was possible to obtain the services of Dr. Muller, the pathologist, and a frozen section was made of the excised ovary. The possibility of the tumor being a Krukenberg or sarcoma made it necessary for us to know whether it was absolutely necessary to remove the second ovary. This we did not wish to do in a young woman unless it was absolutely necessary. Dr. Muller reported that the frozen section of the tumor showed a relatively normal ovarian stroma with marked edema. Therefore a partial resec-

tion was performed of the left ovary leaving a small margin of ovarian tissue which was closed with a fine chromic suture. Following is the pathologic report.

*Edema of the Ovary*—There are two specimens (a) an ovary 3 by 4 by 10 cm. The capsule is thick and smooth. Its consistency is soft. The cut surface shows many small (2 by 5 mm) cysts situated in the periphery under the capsule. At one end several of these cysts contain blood and the stroma is infiltrated

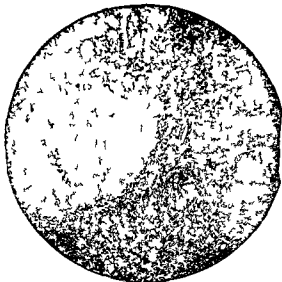


Fig. 260—Showing marked edema of the ovary with presence of follicles.

with blood. The entire ovary has a glairy, watery, clear appearance suggesting marked edema throughout, but most marked in the center. (b) one half of a longitudinally bisected ovary. The piece is  $1\frac{1}{2}$  by 3 by 6 cm. Capsule, presence of the cysts and the appearance of the cut surface are the same as in the other ovary, but there are no hemorrhages.

*Microscopic*—The sections so far examined of specimens (a) and (b) show the structure of an ovary with ova and follicular

cysts normally distributed. The capsule is thick. There are many foci in the stroma especially toward the center of the ovary of irregular edematous areas. The stroma cells are separated by liquid.

This is a condition that I have not found described in the ordinary text books on pathology and it is difficult to understand either the etiology or pathology. If the same pathology had not occurred in both ovaries one might assume that the twisted pedicle on the right side had been the cause of the edema.



Fig. 261.—Photograph of small ovary showing presence of edematous cyst.

Figures 258, 259, and 260 show various areas of the tumor with the resulting edema. The presence of the pathologist and the feasibility of having an immediate frozen section made prevented a double oophorectomy being performed. This patient was returned to follow up about four months after operation and was in all respects well. Pleurocentesis was negative.

**Case III.**—Dr. E. H. Pool has kindly allowed me to present this case as it bears out the necessity of careful inspection of

the second or smaller ovary wherever a tumor growth occurs in one ovary

The patient was a young girl fifteen years of age with a negative history except that for three years her parents had noticed an enlargement of the abdomen

*Physical examination* revealed a large cystic tumor extending from the pubis to the umbilicus and more on the right side of the abdomen. Diagnosis of ovarian cyst was made and laparotomy performed

On the right side a large dermoid cyst measuring about 30 cm was found. This was removed and upon section showed the typical structure of an ovarian dermoid. The left ovary was then examined. It was found to be about 1 cm long in its longest diameter and cystic. It was possible here to do a partial resection. It contained two small dermoid cysts as shown in Fig. 261. While dermoid cysts are usually single in each ovary it is possible that several may occur in one ovary. In this case it is possible that a dermoid may develop in the portion of the ovary remaining but a careful inspection of the remaining portion of the ovary failed to reveal any cystic structure.

The conclusions that may be drawn from this series of cases are *first* tumors of the ovary are very apt to be bilateral *second* wherever possible it is advisable to have a competent pathologist present with facilities for making a frozen section immediately at the time of operation. The majority of ovarian tumors have been so well classified and their malignancy or non malignancy so well studied that upon receipt of a definite pathologic diagnosis we know whether to proceed with a complete extirpation of the ovary or to attempt a resection of the remaining ovary in a young woman *third* ovarian cysts should be removed *en toto* without aspiration of the fluid whenever this is possible

cysts normally distributed. The capsule is thick. There are many foci in the stroma especially toward the center of the ovary of irregular edematous areas. The stroma cells are separated by liquid.

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Fig. 261.—Photograph of small cysts hanging from pedicle of tumor.

Figures 258, 259, and 260 show various areas of the tumor with the resulting edema. The presence of the pathological condition and the feasibility of having an immediate frozen section made prevented a double oophorectomy being performed. This patient was returned to follow up about five months after operation and was in all respects well. Pelvic examination was negative.

Case III.—Dr. E. H. Pool has kindly allowed me to present this case as it bears out the necessity of careful inspection of

the second or smaller ovary wherever a tumor growth occurs in one ovary

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*Physical examination* revealed a large cystic tumor extending from the pubis to the umbilicus and more on the right side of the abdomen. Diagnosis of ovarian cyst was made and laparotomy performed

On the right side a large dermoid cyst measuring about 30 cm was found. This was removed and upon section showed the typical structure of an ovarian dermoid. The left ovary was then examined. It was found to be about 7 cm long in its longest diameter and cystic. It was possible here to do a partial resection. It contained two small dermoid cysts as shown in Fig. 261. While dermoid cysts are usually single in each ovary it is possible that several may occur in one ovary. In this case it is possible that a dermoid may develop in the portion of the ovary remaining but a careful inspection of the remaining portion of the ovary failed to reveal any cystic structure

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